



TAMIL NADU PUBLIC SERVICE COMMISSION

Advertisement No.711

Notification No. 09/2025

Date: 21.05.2025

Combined Technical Services Examination (Non - Interview Posts)

Applications are invited only through online mode for direct recruitment to the posts in Combined Technical Services Examination (Non - Interview Posts).

1. Important Instructions:

1.1. Candidates to ensure their eligibility for the examination:

All candidates are requested to carefully read the "Instructions to Applicants" available in the Commission's website www.tnpsc.gov.in and this Notification. The candidates applying for the examination should ensure that they fulfill all eligibility conditions for admission to the examination. Their admission to all stages of the examination will be purely provisional, subject to their satisfying the eligibility conditions. Mere admission to the written examination, certificate verification, counselling or inclusion of name in the selection list will not confer on the candidates any right to appointment. The Commission reserves the right to reject candidature at any stage, after due process even after selection has been made, if a wrong claim or violation of rules or instructions is confirmed.

1.2. Important Dates and Time:

Date of Notification	21.05.2025		
Date of commencement of receiving application	27.05.2025		
Last date and time for submission of online application	25.06.2025 11:59 PM		
Application Correction Window period	29.06.2025 12:01 AM to 01.07.2025 11:59 PM		
Date and Time of Examination			
Paper - I			
Subject	Subject Code	Date	
Tamil Eligibility Test, General Studies, Aptitude and Mental Ability	503	From 04.08.2025 to 10.08.2025	
Paper - II			
Subject Paper	Subject Code		
Agriculture	491		
Agricultural, Mechanical, Automobile and Civil Engineering	562		
Chemistry	430		
Civil Engineering	398		
Civil Engineering, Traditional Architecture and Sculpture	510		
Computer Science, Information Technology, Electrical, Electronics and Communication Engineering	554		
Computer Science, Computer Application and Information Technology	556		

Criminology, Forensic Science, Psychology and Philosophy	571	From 04.08.2025 to 10.08.2025
Electrical and Electronics Engineering	400	
Environmental and Chemical Engineering	393	
Environmental Science, Biology and Chemistry	557	
Evaluation and Applied Research	213	
Fisheries Science and Zoology	559	
Financial and Cost Accountancy (Intermediate)	433	
Financial and Cost Accountancy (Final)	434	
Hindu Religion and Law	488	
Human Resource Management	572	
Industrial Safety and Health	515	
Library and Information Science	266	
Mechanical, Production and Manufacturing Engineering	399	
Mining Engineering	347	
Mining Engineering and Geology	573	
Personnel Management, Industrial Relations, Business Administration and Social Work	561	
Physics, Chemistry, Biology, Computer Science and Forensic Science	575	
Social Work	370	
Statistics and Mathematics (Degree Standard)	505	
Statistics and Mathematics (PG Degree Standard)	506	
Statistics, Mathematics and Economics	504	
Traditional Architecture and Sculpture	511	
Translation	462	
Translation and Precis Writing	099	
Travel and Tourism	353	
Town Planning, Civil Engineering and Architecture	560	

1.2.1. The paper wise date and time for the examination will be informed only through Commission's website www.tnpsc.gov.in

1.3. How to Apply:

1.3.1. One Time Registration and Online Application:

Candidates are required to apply online by using the Commission's website www.tnpscexams.in. The candidate needs to register himself / herself first at the One Time Registration (OTR) platform, available on the Commission's website, and then proceed to fill up the online application for the examination. If the candidate is already registered, he / she can proceed straightway to fill up the online application for the examination.

1.3.2. Application Correction Window:

After the last date for submission of online application, the Application Correction Window will open for 3 days from 29.06.2025 to 01.07.2025. During this period, candidates will be able to edit the details in their online application. After the last date of the Application Correction Window period, no modification is allowed in the online application.

1.3.3. Subject Paper Options:

Candidates should choose the subject paper(s) and specify in the online application. The candidates should only choose the subject paper(s) in which they have obtained the educational qualification or equivalent qualification for appearing in the examination.

1.3.4. The detailed instructions regarding how to apply and the examination centers are available in Annexure I of this Notification.

1.3.5. Any claim by the candidate after the submission of an online application will not be entertained.

1.4. Banned Items:

1.4.1. Candidates are not allowed to bring mobile phone, pager or any electronic equipment or programmable device or storage media like pen drive, smart watches, watches with in-built memory notes, rings with in-built memory notes, etc., or camera or Bluetooth devices or communication chips or any other equipment or related accessories either in working or switched off mode capable of being used as a communication device into the examination hall / room. Candidates are not allowed to bring non-electronic devices such as P&G Design Data Book, mathematical and drawing instruments, log tables, stencils of maps, slide rules, books, notes, loose sheets, guides, rough sheets, hand bags into the examination hall / room.

1.4.2. If they are found to have any such things or instruments, they will not be allowed to write the examination, besides invalidation of the answer sheet / answer booklets and / or debarment and / or rejection of candidature. If it is considered necessary, they will be subjected to a thorough physical search including frisking on the spot.

1.4.3. Candidates are advised, in their own interest, not to bring any of the banned items including mobile phones to the venue of the examination, as arrangements for safekeeping of the same cannot be assured.

2. Warning:

2.1. All the recruitments by the Tamil Nadu Public Service Commission are purely merit-based. The Tamil Nadu Public Service Commission hereby cautions the candidates against touts and agents who may cheat, by making false promises of securing jobs through unfair means. The Tamil Nadu Public Service Commission shall not be responsible or liable for any loss that may be caused to any candidate on account of indulging in any sort of dealings with such unscrupulous elements.

2.2. Candidates are solely responsible for their claims in the online application. They cannot blame service providers like internet cafes / browsing centers / common service centers for the mistakes made while applying online for recruitment. Candidates are advised to check the filled-in online application before finally submitting the same.

3. Posts and Vacancies:

S. No.	Name of the Post	Post Code	Name of the Department / Organization	Number of Vacancies	Level of Pay
1.	Assistant Engineer (Civil)	3270	Tamil Nadu Water Supply and Drainage Board	1**	Level 20 (CPS)
2.	Junior Planner	3602	Chennai Metropolitan Development Authority	30	
3.	Assistant Engineer (Civil)	3232		03	
4.	Assistant Engineer (Electrical)	3678		01	
5.	Assistant Engineer (Civil)	3603	Hindu Religious and Charitable Endowments	39	
6.	Assistant Sthapathi	3527		38	
7.	Executive Officer, Grade I	1653		5	
8.	Assistant Engineer (Agricultural Engineering)	1667	Agricultural Engineering	116	
9.	Junior Electrical Inspector	1666	Electrical Inspectorate	02	
10.	Assistant Engineer (Civil)	3531	Tamil Nadu Housing Board	09	
11.	Assistant Engineer (Electrical)	3532		01	
12.	Agricultural Officer (Extension)	1678	Agriculture	08	

13.	Assistant Engineer	1661	Highways	92	Level 20 (CPS)	
14.	Assistant Engineer (Civil)	1656	Water Resources	38		
15.	Assistant Director (Industrial Safety and Health)	1664	Industrial Safety and Health	01		
16.	Inspector of Fisheries	1759	Fisheries and Fishermen Welfare	03*		
17.	Assistant Engineer (Civil)	3663	Tamil Nadu Maritime Board	02		
18.	Assistant Engineer	3269	Tamil Nadu Pollution Control Board	38* [@]		
19.	Environmental Scientist	3606		14		
20.	Librarian Grade II	3607		02	Level 8 (CPS)	
21.	Assistant Engineer	1660	Rural Development and Panchayat Raj	41	Level 20 (CPS)	
22.	Research Assistant	1861	Evaluation and Applied Research	01	Level 18 (CPS)	
23.	Statistical Inspector	1697	Animal Husbandry and Veterinary Services	01		
24.	Junior Scientific Officer	1767	Forensic Science	09		
			Group			No. of vacancies
			Chemistry			4
			Biology		1	
			Physics		1	
			Computer Forensic	3		
25.	Junior Manager (Personnel Administration)	3613	Tamil Nadu Urban Finance and Infrastructure Development Corporation Limited	01	Level 18 (EPF)	
26.	Junior Manager (Finance and Accounts)	3352		01		
27.	Computer Programmer	3605		01		Level 16 (EPF)
28.	Junior Manager (Technical)	3608	Tamil Nadu Power Finance and Infrastructure Development Corporation Limited	01	Level 18 (EPF)	
29.	Assistant Superintendent of Vigilance Institutions	2086	Children Welfare and Special Services	01 ^{\$}	Level 17 (CPS)	
30.	Assistant Engineer (Civil)	3368	State Industries Promotion Corporation of Tamil Nadu Limited	17	Level 17 (GFTR, PFTR, SPF cum GSTR)	
31.	Translator (Tamil Cell)	3106	Law	01	Level 16 (CPS)	
32.	System Manager	3664	Civil Supplies and Consumer Protection	09		
33.	Assistant Section Officer (Translation)	2069	Tamil Development and Information	05 [#]		
34.	Senior Accountant	3702	Tamil Nadu Minerals Limited	04	Level 18 (CPS)	
35.	Assistant Manager (Mines)	3274		12	Level 16	
36.	Project Officer	3614		03	(EPF)	

37.	Executive (P&A)	3604	Tamil Nadu Cements Corporation Limited	01 ^{\$}	Level 15 (EPF)
38.	Statistical Assistant	3125	Food Safety and Drug Administration	01	Level 13 (CPS)
39.	Mining Engineer	3612	Tamil Nadu Magnesite Limited	01	Level 13 (EPF)
40.	Assistant Engineer (Electrical)	3610		01	Level 12 (EPF)
41.	Assistant Engineer (Mechanical)	3611		03	(EPF)
42.	Junior Chemist	3609		03	Level 8 (EPF)
43.	Community Officer	3701		Tamil Nadu Urban Habitat Development Board	15
44.	Assistant Statistical Investigator	1824	Economics and Statistics	33 [#]	Level 10 (CPS)
45.	Librarian	1854	State Council of Educational Research and Training	01	
46.	Assistant Tourist Officer, Grade II	3111	Tourism	04	
47.	Computer-cum-Vaccine Store Keeper	3201	Public Health and Preventive Medicine	01	Level 8 (CPS)
Total				615	
* Including backlog vacancies					
** Only backlog vacancies					
@ Vacancies for reservation for outstanding sports persons, are deducted wherever applicable					
\$ Only shortfall vacancy					
# Including shortfall vacancies					
Abbreviations:					
CPS – Contributory Pension Scheme					
EPF – Employees' Provident Fund					
GFTR – Gratuity Fund Trust Rules					
PFTR – Provident Fund Trust Rules					
SPF cum GSTR – SPF-cum-Gratuity Scheme Trust Rules.					

3.1. The number of vacancies notified is tentative and is liable for modification, before the start of counselling.

3.2. The Commission reserves the right to include additional posts with different nomenclature and having similar eligibility conditions, as announced in this notification.

3.3. The post wise distribution of vacancies is available in the Annexure VI of this Notification.

4. Eligibility Conditions:

4.1. Age Limit: (as on 01.07.2025)

The candidates should have completed the age of 21 years for all the posts, except for the post of Executive Officer, Grade I (Post Code: 1653). The candidates should have completed 30 years for the post of Executive Officer, Grade I (Post Code.1653). The category wise maximum age limit and age concession details are given below:

4.1.1. Others (Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs):

S. No.	Name of the Post	Post Code	Maximum Age (Should not have completed)	Age Concession		
				Persons with Benchmark Disability	Ex-Servicemen	Destitute Widow
1.	Agricultural Officer (Extension)	1678	32*	42**	50	No Maximum Age Limit
2.	Assistant Engineer (Civil)	3270	32	42		
3.	Assistant Engineer (Civil)	1656				
4.	Assistant Engineer (Civil)	3531				
5.	Assistant Engineer (Civil)	3232				
6.	Assistant Engineer (Agricultural Engineering)	1667				
7.	Inspector of Fisheries	1759				
8.	Assistant Engineer	1661				
9.	Assistant Engineer (Electrical)	3532				
10.	Assistant Engineer (Electrical)	3678				
11.	Assistant Statistical Investigator	1824				
12.	Research Assistant	1861				
13.	Community Officer	3701				
14.	Junior Electrical Inspector	1666				
15.	Computer-cum-Vaccine Store Keeper	3201				
16.	Assistant Engineer	1660				
17.	Assistant Section Officer (Translation)	2069				
18.	Librarian	1854				
19.	Assistant Engineer (Civil)	3663				
20.	Assistant Engineer (Civil)	3603				
21.	Assistant Engineer (Electrical)	3610				
22.	Assistant Engineer (Mechanical)	3611				
23.	Junior Chemist	3609				
24.	Assistant Sthapathi	3527				
25.	Assistant Director (Industrial Safety and Health)	1664				
26.	Statistical Inspector	1697				
27.	Junior Scientific Officer	1767				
28.	Junior Manager (Personnel Administration)	3613				
29.	Junior Manager (Finance and Accounts)	3352				
30.	Junior Manager (Technical)	3608				
31.	Assistant Superintendent of Vigilance Institutions	2086				
32.	Translator (Tamil Cell)	3106				
33.	Assistant Manager (Mines)	3274				
34.	Project Officer	3614				
35.	Senior Accountant	3702				
36.	Computer Programmer	3605				
37.	Assistant Tourist Officer, Grade II	3111				
38.	Mining Engineer	3612				
39.	Junior Planner	3602				
40.	Statistical Assistant	3125				
41.	Executive (P&A)	3604				

42.	System Manager	3664	35	NA	50	No Maximum Age Limit
43.	Executive Officer, Grade I	1653	37	47		
44.	Assistant Engineer	3269	32	42	32	34
45.	Environmental Scientist	3606				
46.	Librarian Grade II	3607				
47.	Assistant Engineer (Civil)	3368		NA		32
* 34 years for persons holding a Post Graduate Degree in Agriculture or Ph.D.,						
** 44 years for persons holding a Post Graduate Degree in Agriculture or Ph.D.,						
NA - Not Applicable, since persons with benchmark disability are not eligible to apply for this post.						

4.1.2. BC (OBCM)s, BCMs, MBCs/DCs, SCs, SC(A)s and STs:

S. No.	Name of the Post	Post Code	Maximum Age (Should not have completed)	Age Concession		
				Persons with Benchmark Disability	Ex-Service men	Destitute Widow
1.	Assistant Engineer (Civil)	3603	No Maximum Age Limit	NA	No Maximum Age Limit	
2.	Assistant Engineer (Civil)	3663				
3.	Assistant Engineer (Electrical)	3610				
4.	Assistant Engineer (Mechanical)	3611				
5.	Assistant Sthapathi	3527				
6.	Assistant Director (Industrial Safety and Health)	1664				
7.	Junior Manager (Personnel Administration)	3613				
8.	Junior Manager (Finance and Accounts)	3352				
9.	Junior Manager (Technical)	3608				
10.	Translator (Tamil Cell)	3106				
11.	Assistant Manager (Mines)	3274				
12.	Project Officer	3614				
13.	Senior Accountant	3702				
14.	Computer Programmer	3605				
15.	System Manager	3664				
16.	Mining Engineer	3612				
17.	Assistant Tourist Officer, Grade II	3111				
18.	Executive (P&A)	3604				
19.	Statistical Inspector	1697				
20.	Junior Scientific Officer	1767				
21.	Statistical Assistant	3125				
22.	Librarian	1854				
23.	Assistant Superintendent of Vigilance Institutions	2086				
24.	Junior Chemist	3609				
25.	Assistant Engineer (Civil)	3270	No Maximum Age Limit			
26.	Assistant Engineer (Civil)	3531				
27.	Assistant Engineer (Civil)	1656				
28.	Assistant Engineer (Electrical)	3532				
29.	Assistant Engineer	1661				
30.	Assistant Engineer	1660				
31.	Executive Officer, Grade I	1653				

32.	Assistant Engineer (Agricultural Engineering)	1667	No Maximum Age Limit				
33.	Junior Electrical Inspector	1666					
34.	Agricultural Officer (Extension)	1678					
35.	Inspector of Fisheries	1759					
36.	Research Assistant	1861					
37.	Community Officer	3701					
38.	Assistant Statistical Investigator	1824					
39.	Computer-cum-Vaccine Store Keeper	3201					
40.	Assistant Section Officer (Translation)	2069					
41.	Assistant Engineer (Civil)	3232					BC(OBCM)s, BCMs MBCs/DCs-34, SCs, SC(A)s, STs-37
42.	Assistant Engineer (Electrical)	3678					
43.	Junior Planner	3602	NA	BC(OBCM)s, BCMs MBCs/DCs-34, SCs, SC(A)s, STs-37			
44.	Assistant Engineer (Civil)	3368					
45.	Assistant Engineer	3269	37	47	55	39	
46.	Environmental Scientist	3606					
47.	Librarian Grade II	3607					
Abbreviations:							
BC(OBCM) - Backward Classes (Other than Backward Class Muslims)							
BCM - Backward Class Muslims							
MBC / DC - Most Backward Classes / Denotified Communities							
SC - Scheduled Castes							
SC(A) - Scheduled Castes (Arunthathiyars)							
ST - Scheduled Tribes							
NA - Not Applicable, since persons with benchmark disability are not eligible to apply for this post.							

4.1.3. The above mentioned age concession will not apply to the Ex-Servicemen candidates who have already been recruited to any class or service or category, as per section 3 (j) (vii) of Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

4.1.4. No maximum age limit shall mean that the candidates should not have completed 60 years of age as on 1.7.2025 or at the time of selection / appointment to the post.

4.1.5. Supporting Documents:

4.1.5.1. The date of birth will be verified against the tenth standard (SSLC) or twelfth standard (HSC) mark sheet, issued by the Tamil Nadu Board of Secondary Education and Tamil Nadu Board of Higher Secondary Education respectively. Those candidates whose date of birth is not mentioned in their tenth standard / twelfth standard mark sheet must upload their Birth Certificate / Transfer Certificate / Degree marksheets, instead of the tenth standard or twelfth standard marksheet. Any other form of evidence will not be accepted. Failure to upload such a document shall result in the rejection of candidature after due process.

4.1.5.2. Candidates claiming age concession should upload the supporting documents for such a claim. Failure to upload such a document shall result in the rejection of candidature after due process.

4.2. Educational Qualification and Technical Qualification:

S. No.	Name of the Post	Post Code	Qualification
1.	Assistant Engineer (Civil)	3270	(i) Must possess a Degree in Engineering (Civil) from any University or Institution recognized by the University Grants Commission for the purpose of its Grant (ii) Other things being equal preference shall be given to persons who possess the Post Graduate Degree or Post Graduate Diploma in Public Health Engineering
2.	Assistant Engineer (Civil)	3531	Must possess a degree in B.E. (Civil) from any recognized University or any other equivalent qualification or A pass in Section A and B of the Associate Member of the Institution of Engineers (India) Examinations under Civil Engineering
3.	Assistant Engineer	1661	(i) Must possess a degree in Civil Engineering or A pass in Sections A and B of the Associate Member of the Institution of Engineers (India) Examinations (re-named as Institution of Examinations) (ii) Other things being equal, preference shall be given to a person who has undergone one year of Apprenticeship training under the Government of India Scheme or one year of training under the State Government Apprenticeship Scheme
4.	Assistant Engineer (Civil)	1656	(i) Must possess the B.E degree in Civil Engineering or Civil and Structural Engineering; or Must have passed in Sections A and B of the Institution Examinations under Civil Engineering Branch (ii) Other things being equal, preference shall be given to those who have undergone one year of apprenticeship training under the Government of India scheme or the State Government Apprenticeship scheme (iii) Other things being equal, preference shall be given to released Emergency commissioned officers, released short service commissioned officers or other Ex-servicemen released from the Armed Forces
5.	Assistant Engineer (Civil)	3663	B.E/B.Tech (Civil) in any recognized Universities
6.	Assistant Engineer (Civil)	3368	Must possess B.E/B.Tech Degree in Civil Engineering from a recognized University / Institution
7.	Assistant Engineer	1660	(i) Must possess a B.E degree in Civil Engineering (or) Must have passed Sections A and B of the Institution of Engineers (India) in Civil Engineering Branch, and he should furnish evidence of having undergone practical training in surveying for a period of not less than one year (ii) Other things being equal preference shall be given for appointment to a person who has undergone one year of apprenticeship under the Government of India Scheme or the State Government Apprenticeship Scheme

8.	Assistant Engineer (Civil)	3603	(i) Must possess Bachelor of Engineering degree in Civil or Bachelor of Technology degree in Civil Engineering or Bachelor of Technology in Traditional Architecture or Bachelor of Fine Arts in Traditional Sculpture or its equivalent awarded by an Institute recognized by the All India Council for Technical Education (ii) Other things being equal, first preference shall be given to candidates who hold a degree in Bachelor of Technology in Traditional Architecture awarded by the Government College of Architecture and Sculpture, Mamallapuram, secondly to candidates who hold a degree in Bachelor of Fine Arts in Traditional Sculpture awarded by the Government College of Architecture and Sculpture, Mamallapuram
9.	Assistant Engineer (Civil)	3232	Must possess a Bachelor's Degree in Civil in recognized University
10.	Junior Electrical Inspector	1666	(i) Must possess a degree in Electrical Engineering (ii) Other things being equal preference shall be given to those who have undergone Apprenticeship Training under Government of India Scheme or State Government Apprenticeship Scheme for a period of one year
11.	Assistant Engineer (Electrical)	3532	Must possess a degree in B.E. (Electrical) from any recognized University or any other equivalent qualification (or) A pass in Section A and B of the Associate Member of the Institution of Engineers (India) Examinations under Electrical Engineering
12.	Assistant Engineer (Electrical)	3610	B.E. Electrical Engineering with 'C' Licence
13.	Assistant Engineer (Electrical)	3678	Must possess a Bachelor's Degree in Electrical in recognized University
14.	Assistant Engineer (Mechanical)	3611	B.E., Mechanical Engineering
15.	Assistant Director (Industrial Safety and Health)	1664	A Degree in Mechanical or Electrical or Chemical Engineering or Textile Technology or Industrial Engineering or Production Engineering
16.	Assistant Engineer (Agricultural Engineering)	1667	(i) B.E. (Agriculture) or B. Tech. (Agricultural Engineering) or B.Sc. (Agricultural Engineering) (or) (ii) B.E. (Mechanical) (or) B.E. (Civil) (or) B.Tech. (Automobile Engineering) or B.E. (Production Engineering) or B.E.(Industrial Engineering) (or) B.E. (Civil and Structural Engineering) or B.E (Mechanical and Production Engineering) (iii) Candidates possessing the qualification in item (ii) shall be considered only if no candidate with qualification in item (i) is available
17.	System Manager	3664	(i) A Bachelor's Degree in Engineering (B.E) or Bachelor's degree in Technology (B.Tech) with Computer Science and Engineering or Computer Engineering or Information Technology or Electronics and Communication Engineering or Electrical and Electronics Engineering as main subject or a Post Graduate degree in Computer Applications (MCA) or Computer Science or Information

			Technology as main subject from any University or Institution recognized: (ii) Candidates with Master Degree in Computer Application should have a Bachelor's Degree in Science or Mathematics from any recognized University; and (iii) Must have studied Under Graduate/Post Graduate Degree, as the case may be, after completion of SSLC and Higher Secondary Course								
18.	Computer Programmer	3605	A Master Degree in Computer Application or a Master Degree in Science (Information Technology / Computer Science) of any University or Institution recognized by the University Grants Commission for the purpose of its grant								
19.	Junior Planner	3602	Must possess a Bachelor's Degree in Town and Country Planning from a University Grants Commission/All India Council for Technical Education recognized University; (or) B.E./B.Tech. in Civil Engineering from a University Grants Commission/All India Council for Technical Education recognized University; (or) Must Possess Bachelor's Degree in Architecture from a University Grants Commission/ All India Council for Technical Education recognized University								
20.	Librarian	1854	(i) A Degree of any University recognized by University Grants Commission or Higher Education Commission of India and (ii) A Degree in Library Science from any University recognized by University Grants Commission or Higher Education Commission of India for the purpose of its grant								
21.	Librarian Grade II	3607	Must possess a Bachelor's Degree in Library Science (B.L.I.S)								
22.	Statistical Inspector	1697	Must possess a degree of any University or Institution recognised by the University Grants Commission for the purpose of its grant, with Statistics or Mathematics, as the main subject								
23.	Junior Scientific Officer	1767	(i) M.Sc. (Forensic Science) degree and a degree in the subject, for the group as shown in the explanation below to which he/she is appointed (or) M.Sc. degree in the subject for the group as shown in the explanation below to which he/she is appointed. (ii) Other things being equal, preference shall be given to person who holds a degree in M.Sc. (Forensic Science). Explanation: The group, Division and subjects are specified below:-								
			<table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Name of the Group (2)</th> <th>Division/Unit belonging to the Group (3)</th> <th>Subject eligible for Division/Unit (4)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Biology</td> <td>i Anthropology</td> <td>Zoology / Physical Anthropology</td> </tr> </tbody> </table>	Sl. No.	Name of the Group (2)	Division/Unit belonging to the Group (3)	Subject eligible for Division/Unit (4)	1	Biology	i Anthropology	Zoology / Physical Anthropology
Sl. No.	Name of the Group (2)	Division/Unit belonging to the Group (3)	Subject eligible for Division/Unit (4)								
1	Biology	i Anthropology	Zoology / Physical Anthropology								

				ii	Biology	Botany / Zoology / Bio-Chemistry / Micro-Biology / Bio-Technology / Genetics
				iii	Serology	
				iv	DNA	
		2	Chemistry	i	Chemistry	Chemistry (Organic / Inorganic / Physical / Analytical / Polymer / Applied) / Environmental Toxicology
				ii	Explosives	
				iii	Narcotics	
				iv	Toxicology	Chemistry (Organic / Inorganic / Physical / Analytical / Polymer / Applied) / Bio-Chemistry / Environmental Toxicology
				v	Prohibition	
				vi	Excise	
		3	Physics	Physics		Physics
		4	Physics and Chemistry	i	Ballistics	Physics / Chemistry (Organic / Inorganic / Physical / Analytical / Polymer /Applied)
				ii	Computer Forensic Science	
		<p>Note:</p> <p>The individuals who possess M.Sc. degree in Computer Science must have acquired a basic degree in Physics or Chemistry as major subject</p> <p>The individuals who possess M.Sc. degree in Environmental Toxicology must have acquired a basic degree with Chemistry as major subject, for appointment in Chemistry or Prohibition or Excise or Explosives or Narcotics Divisions/Units</p> <p>The individuals who possess M.Sc. degree in Physics or Chemistry or Forensic Science with a basic degree in Physics or Chemistry as major subject must have acquired a Diploma or Post-graduate Diploma in Computer Application or any subject related to Computer Science for appointment in Computer Forensic Science Division/Unit.</p>				
24.	Computor-cum-Vaccine Store Keeper	3201	<p>A degree in Statistics or a degree in Mathematics with Statistics as a Special Subject or having qualified in any one of the following subjects namely:-</p> <ol style="list-style-type: none"> i. Fundamental Statistics, Applied Statistics probability and Applied Statistics and Basic Statistics for actuarial Science ii. Fundamental Statistics and Applied Statistics iii. Applied Statistics only iv. Probability and applied Statistics v. Practical Statistics and Statistics interference 			

25.	Assistant Statistical Investigator	1824	Must hold a Degree in Statistics or Mathematics or Economics or Applied Economics or Business Economics
26.	Statistical Assistant	3125	A Master degree in Mathematics or Statistics with working knowledge of computer statistical tools
27.	Research Assistant	1861	Must possess a first class Post-Graduate degree in Economics or Econometrics or Statistics or Business Administration or Mathematics or Social work or Sociology or Anthropology or Agricultural Economics or Public Administration
28.	Assistant Manager (Mines)	3274	(i) B.E. (Mining), (Preferably from Anna University, Chennai) (ii) Should possess II class Mines Managers Certificate of Competency issued by Directorate General of Mines Safety, Dhanbad, Jharkhand
29.	Mining Engineer	3612	B.E. (Mining Engineering)
30.	Project Officer	3614	Graduate in Mining Engineering (or) a Post Graduate Degree in Geology or Applied Geology
31.	Assistant Engineer	3269	Master's Degree in Environmental Engineering or Chemical Engineering or M.Tech. Environmental Science and Technology or M.Tech. Petroleum Refining and Petrochemical or M.E. Environmental Management awarded by Anna University with a basic qualification of Bachelor's Degree in Civil Engineering or Chemical Engineering or Environmental Engineering
32.	Environmental Scientist	3606	Master's Degree in Science in any one of the following discipline a. Chemistry b. Biology c. Zoology d. Environmental Chemistry e. Environmental Science f. Environmental Toxicology g. Microbiology h. Marine Biology i. Bio-Chemistry j. Analytical Chemistry k. Applied Chemistry l. Botany
33.	Assistant Sthapathi	3527	(i) Must possess Bachelor of Technology in Traditional Architecture or Bachelor of Fine Arts in Traditional Sculpture (ii) Other things being equal, preference shall be given to those who have obtained a degree in Bachelor of Technology in Traditional Architecture or Bachelor of Fine Arts in Traditional Sculpture awarded by the Government College of Architecture and Sculpture, Mamallapuram
34.	Executive Officer, Grade I	1653	(i) Must possess a degree in Arts, Science or Commerce and also a degree in Law of a University, recognized by the University Grants Commission for the purpose its of Grant

			<p>(ii) Other things being equal, preference shall be given to persons who hold the Diploma in Epigraphy and Archaeology awarded by the Institute of Epigraphy in Tamil Nadu</p> <p>(iii) Other things being equal, preference will be given to the employees of Religious Institutions (other than Government Servants) who have put in not less than 5 years of Service</p>
35.	Agricultural Officer (Extension)	1678	<p>(i) A Bachelor degree in Agriculture and,</p> <p>(ii) Must possess adequate knowledge of Tamil</p>
36.	Inspector of Fisheries	1759	<p>(i) Must possess a degree of Bachelor of Fisheries Science awarded by the Tamil Nadu Fisheries University or any other University or Institution recognized by the University Grants Commission;</p> <p>(or)</p> <p>(ii) Must possess a degree of M.Sc. in Zoology or Marine Biology or Coastal Aquaculture or Mariculture or Special Zoology or Coastal Engineering or Oceanography awarded by any University or Institution recognized by the University Grants Commission</p> <p>(iii) Candidates possessing the qualifications prescribed in item (ii) shall be considered only if no candidates with qualification prescribed in item (i) are available.</p>
37.	Junior Manager (Finance and Accounts)	3352	<p>(i) A Degree of any University or Institution recognized by the University Grants Commission for the purpose of its grant; and</p> <p>(ii) Must have passed an Intermediate Examination conducted by the Institute of Chartered Accountants of India / Institute of Cost Accountants of India</p>
38.	Junior Manager (Technical)	3608	Chartered Accountant (CA) / Cost Management Accountants (CMA)
39.	Senior Accountant	3702	<p>(i) A Bachelor Degree in Commerce awarded by recognized University and</p> <p>(ii) Pass in the Intermediate examination of the Institute of Cost and Management Accountants of India or Institute of Chartered Accountants of India</p>
40.	Translator	3106	<p>(i) Must possess a degree in Law awarded by any University or Institution recognized by the University Grants Commission and recognized by the Bar Council of India for the purpose of enrolment as an Advocate and</p> <p>(ii) Proficiency in Tamil</p> <p>(iii) Other things being equal, preference shall be given to the persons with previous experience in translation of Deeds, Agreements, Bill, Acts, Rules or Orders from English to Tamil</p>
41.	Assistant Section Officer (Translation)	2069	A Degree of any University recognized by the University Grants Commission with Tamil in any one of the parts in the Degree course
42.	Junior Chemist	3609	B.Sc. (Chemistry)
43.	Assistant Tourist Officer, Grade II	3111	<p>(i) Degree in Travel and Tourism or any Degree with Diploma in Tourism</p> <p>(ii) Certificate Course in Computer on Office Automation</p>

			awarded by the Directorate of Technical Education, Government of Tamil Nadu or its equivalent; and (iii) Proficiency in English and Tamil Languages i.e. must have studied both Tamil and English as one of the subjects at SSLC or HSC level
44.	Community Officer	3701	Must possess a Master's Degree in Social Work of a recognized University
45.	Junior Manager (Personnel Administration)	3613	(i) A Degree of any University or Institution recognized by the University Grants Commission for the purpose of its grant; and (ii) A Master Degree in Human Resource Management of any University or Institution recognized by the University Grants Commission for the purpose of its grant.
46.	Assistant Superintendent of Vigilance Institutions	2086	A Master's degree in Criminology or Forensic Science; (or) B.A. degree in Psychology or in Philosophy with Psychology as one of the subjects of study
47.	Executive (P&A)	3604	Master of Social Work or MBA or M.A (Sociology) or Master of Personnel Management and Industrial Relations from a recognised University/Institution

4.2.1. The candidates should possess the educational qualification and technical qualification prescribed for the post, on the date of notification.

4.2.2. The Under Graduate / Post Graduate degree / Ph.D Degree certificate qualification prescribed for the above posts should have been obtained by passing the required qualification in the following order of studies viz., SSLC + HSC / Diploma or its equivalent + Under Graduate Degree + Post Graduate Degree + Ph.D Degree.

4.2.3. Supporting Documents:

4.2.3.1. SSLC / HSC / Diploma / Degree / PG Degree / Integrated PG Degree / Ph.D Degree / Provisional Degree or Provisional Diploma Certificate / Consolidated Mark Sheet along with Degree or Provisional Degree Certificate shall be accepted as proof of educational qualification.

4.2.3.2. In cases where the Diploma / Degree / PG Degree / Ph.D Degree certificates had been issued after the date of notification, candidates must upload proof of the publication of results of the respective qualification(s) on or before the date of notification in the form of Provisional Diploma / Degree Certificate / Consolidated Mark Sheet / Certificate from the Head of the Institution / University in the format prescribed in Annexure V.

4.2.3.3. Candidates claiming possession of qualification higher than that prescribed for a post, must upload certificates, issued on / before the date of notification, in support of such claim.

4.2.3.4. In cases where the duration of the prescribed educational / technical course has been specified in the notification, any discrepancy between the claim in the application and the documents uploaded shall result in the rejection of candidature after due process.

4.2.3.5. In case the Degree Certificate is lost or is not immediately available for reasons to be specified, an extract from the Convocation Register will be accepted as evidence of qualification.

4.2.3.6. The candidates claiming equivalence of qualification should upload a copy of the Government order at the time of uploading of documents, failing which his / her candidature will be rejected after due process. The Government orders relating to equivalence of qualification are available on the website of the Tamil Nadu State Council for Higher Education (www.tnsche.tn.gov.in). The Government orders

regarding equivalence of qualification issued after the date of physical certificate verification will not be considered for this recruitment.

4.3. Medical and Physical Standards:

4.3.1. Candidates selected for appointment to the posts will be required to submit a certificate of physical fitness to the Appointing Authority at the time of joining the post.

4.3.2. The prescribed standards of visual acuity of the candidates selected for the following posts are mentioned below;

S. No.	Name of the Post	Post Code	Standard of Vision
1.	Assistant Superintendent of Vigilance Institutions	2086	Standard I or better
2.	Junior Scientific Officer	1767	Standard I or better. Colour blindness will be a disqualification
3.	Assistant Engineer (Agricultural Engineering)	1667	Standard II
4.	Assistant Engineer	1661	Standard II or better
5.	Assistant Engineer (Civil)	3232	
6.	Assistant Engineer (Electrical)	3678	
7.	Junior Planner	3602	
8.	Junior Electrical Inspector	1666	
9.	Assistant Director (Industrial Safety and Health)	1664	
10.	Agricultural Officer (Extension)	1678	
11.	Assistant Engineer (Civil)	3663	Standard III or better. Colour blindness will be a disqualification
12.	Research Assistant	1861	Standard III or better
13.	Computer-cum-Vaccine Store Keeper	3201	
14.	Assistant Statistical Investigator	1824	
15.	Assistant Engineer (Civil)	3270	
16.	Assistant Engineer (Civil)	3603	
17.	Assistant Engineer (Civil)	3531	
18.	Assistant Engineer (Civil)	1656	
19.	Assistant Engineer (Civil)	3368	
20.	Assistant Engineer (Electrical)	3532	
21.	Assistant Engineer (Electrical)	3610	
22.	Assistant Engineer (Mechanical)	3611	
23.	Assistant Engineer	3269	
24.	Assistant Engineer	1660	
25.	Assistant Tourist Officer, Grade II	3111	
26.	Assistant Sthapathi	3527	
27.	Executive Officer, Grade I	1653	
28.	Inspector of Fisheries	1759	
29.	Statistical Inspector	1697	
30.	Junior Manager (Personnel Administration)	3613	
31.	Junior Manager (Finance and Accounts)	3352	
32.	Junior Manager (Technical)	3608	
33.	Translator (Tamil Cell)	3106	
34.	Assistant Manager (Mines)	3274	
35.	Project Officer	3614	
36.	Senior Accountant	3702	
37.	Computer Programmer	3605	
38.	System Manager	3664	
39.	Librarian	1854	

40.	Mining Engineer	3612	Standard III or better
41.	Community Officer	3701	
42.	Junior Chemist	3609	
43.	Statistical Assistant	3125	
44.	Executive (P&A)	3604	
45.	Environmental Scientist	3606	
46.	Librarian Grade II	3607	
47.	Assistant Section Officer (Translation)	2069	

4.3.3. Candidates with defective vision should submit an Eye Fitness certificate from a qualified Eye Specialist working in a Government Hospital at the time of joining the post, to the Appointing Authority.

4.3.4. Candidates who have applied for the posts of Junior Scientific Officer (Post Code-1767), Agricultural Officer (Extension) (Post Code-1678), Assistant Engineer (Civil) (Post Code-3663), Research Assistant (Post Code-1861) and Computer-cum-Vaccine Store Keeper (Post Code-3201) should upload the eye fitness certificate obtained from the specialist in Ophthalmology working in the Government Hospital in the format prescribed in Annexure V at the time of submission of online application. Failing which his/her application will not be considered for the said posts.

4.4. Knowledge in Tamil:

4.4.1. Candidates should possess adequate knowledge in Tamil on the date of this Notification. The candidate shall be deemed to possess an adequate knowledge of Tamil if, he/she has passed the SSLC examination or its equivalent examination / HSC / Degree, etc., with Tamil as one of the languages or studied the High School Course in Tamil medium; or passed the SSLC examination or its equivalent examination in Tamil medium; or passed the Second Class Language Test (Full Test) in Tamil conducted by the Tamil Nadu Public Service Commission.

4.4.2. Candidates must upload either SSLC / HSC / Degree / PG Degree mark sheets or proof of having passed the Second Class Language Test (Full Test) in Tamil conducted by the Tamil Nadu Public Service Commission, at the time of submission of online application.

4.4.3. Failure to produce documents in support of the possession of adequate knowledge of Tamil, shall result in the candidate being required to pass the Second Class Language Test (Full Test) in Tamil conducted by the Commission, within a period of two years from the date of his / her appointment, failing which he / she shall be discharged from service. This instruction is not applicable to the post of Agricultural Officer (Extension) (Post Code-1678), Assistant Tourist Officer, Grade II (Post Code-3111) Translator (Tamil Cell) (Post Code-3106) and Assistant Section Officer (Translation) (Post Code-2069).

4.5. Restrictions on applying for the Examination:

4.5.1. The candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s, and BCMs, who have put in 5 years or more of service, since his/ her first appointment to a service of Government of India or Government of a State / Union Territory, are not eligible to apply even if they are within the age limit.

4.5.2. Persons professing Hindu religion alone are eligible for the posts of Assistant Engineer (Civil) (Post Code-3603), Assistant Sthapathi (Post Code-3527) and Executive Officer, Grade I (Post Code-1653) in the Hindu Religious and Charitable Endowments Department. Candidates applying for these posts should produce a Community Certificate / Certificate from the Revenue Authorities concerned, in support of the religion claimed in the online application, while applying online. Failure to upload such a certificate, shall result in the rejection of claim after due process.

4.5.3. The persons with benchmark disabilities are not eligible for the following posts;

S.No.	Name of the Post	Post Code	Department / Organization
1.	Assistant Engineer (Civil)	3603	Hindu Religious and Charitable Endowments
2.	Assistant Sthapathi	3527	
3.	Assistant Director (Industrial Safety and Health)	1664	Industrial Safety and Health
4.	Statistical Inspector	1697	Animal Husbandry and Veterinary Services
5.	Junior Manager (Personnel Administration)	3613	Tamil Nadu Urban Finance and Infrastructure Development Corporation Limited
6.	Junior Manager (Finance and Accounts)	3352	
7.	Computer Programmer	3605	
8.	Junior Manager (Technical)	3608	Tamil Nadu Power Finance and Infrastructure Development Corporation Limited
9.	Assistant Engineer (Civil)	3368	State Industries Promotion Corporation of Tamil Nadu Limited
10.	Assistant Engineer (Civil)	3663	Tamil Nadu Maritime Board
11.	Translator (Tamil Cell)	3106	Law
12.	Senior Accountant	3702	Tamil Nadu Minerals Limited
13.	Assistant Manager (Mines)	3274	
14.	Project Officer	3614	
15.	System Manager	3664	Civil Supplies and Consumer Protection
16.	Junior Chemist	3609	Tamil Nadu Magnesite Limited
17.	Assistant Engineer (Electrical)	3610	
18.	Assistant Engineer (Mechanical)	3611	
19.	Mining Engineer	3612	
20.	Librarian	1854	State Council of Educational Research and Training
21.	Assistant Superintendent of Vigilance Institutions	2086	Children Welfare and Special Services
22.	Statistical Assistant	3125	Food Safety and Drug Administration
23.	Assistant Tourist Officer, Grade II	3111	Tourism
24.	Executive (P&A)	3604	Tamil Nadu Cements Corporation Limited
25.	Junior Planner	3602	Chennai Metropolitan Development Authority
26.	Junior Scientific Officer	1767	Forensic Science

4.6. Posts identified suitable for Persons with Benchmark Disability:

4.6.1. The following posts are identified as suitable for reservation to persons with benchmark disabilities as detailed below:

S. No.	Name of the Post	Post Code	Suitable Category of Benchmark Disabilities
1.	Executive Officer, Grade I	1653	HH, AC
2.	Assistant Engineer (Agricultural Engineering)	1667	LV, HI, HH, LD, LC, DF, AC
3.	Assistant Engineer (Civil)	3232	LD(OA, OL), HH, LC, DF, AC
4.	Assistant Engineer (Civil)	1656	LD(OA, OL), HH, DF, AC
5.	Assistant Engineer (Civil)	3531	HH, LD (OA, OL, Others), LC, AC, DF, SLD
6.	Assistant Engineer (Civil)	3270	
7.	Assistant Engineer (Electrical)	3532	

8.	Assistant Engineer (Electrical)	3678	LD(OA,OL),HH,LC,DF,AC
9.	Assistant Engineer	1661	HH
10.	Assistant Engineer	1660	HH,LD(OA,OL), LC,AC,DF
11.	Agricultural Officer (Extension)	1678	LV, HH, LD, CP, LC, DF, AC, MuD
12.	Inspector of Fisheries	1759	LV, LC, DF
13.	Junior Electrical Inspector	1666	OA, OL, HH
14.	Research Assistant	1861	LV, HH, LD, CP,LC, DF, AC, ASD
15.	Assistant Engineer	3269	LV,LD(OA,OL,OAOL), HH, AC, LC, DF
16.	Environmental Scientist	3606	LV,HI,HH,LD(OA,OL,BL,OAOL), LC,DF,AC
17.	Computer-cum-Vaccine Store Keeper	3201	LV,HH,LD(OL),AC,LC,DF,SLD
18.	Assistant Section Officer (Translation)	2069	LV,HH,LD(OA,OL,BL,OAL,BLOA), LC,DF,AC
19.	Librarian Grade II	3607	All categories of Benchmark Disabilities
20.	Assistant Statistical Investigator	1824	
21.	Community Officer	3701	

Abbreviations:

LV – Low Vision	ASD – Autism Spectrum Disorder
BLOA – Both Leg One Arm	BL – Both Leg
HH – Hard of Hearing (with assistive device)	CP – Cerebral Palsy
HI – Hearing Impaired	LC – Leprosy Cured
LD – Locomotor Disability	AC – Acid Attack Victims
OA – One Arm	DF – Dwarfism
OL – One Leg	MuD – Muscular Dystrophy
OAOL – One Arm One Leg	OAL – One Arm Leg
LD(others) – Scoliosis and / or Kyphoscoliosis, Kyphosis, Spinal Cord Injuries and Spine Kyphoscoliosis.	SLD – Specific Learning Disability

4.6.2. Persons with Benchmark Disability with only those category (ies) of disability (ies) mentioned above shall be eligible to apply for this Examination under Persons with Benchmark Disability category. Therefore candidates concerned are advised to read it carefully before applying appropriately for admission to the Examination.

5. Plan of Examination:

5.1. The Combined Technical Services Examination (Non-Interview Posts) will be conducted as single stage Written Examination. The candidates will be admitted to the examination, based on the claims made in the online application.

5.2. Ranking Procedure:

5.2.1. The merit list or ranking list shall be prepared on the basis of total marks secured by the candidates in the written examination. Marks obtained by the candidates in the examination (Part B and Part C of Paper I and Paper II) would determine final ranking.

5.2.2. In case of two or more candidates scoring equal marks, the candidate possessing the higher qualification shall be placed above in the merit list.

5.2.3. When the marks obtained in the written examination and the qualification are also the same, then the candidate senior in age shall be placed above in the merit list.

5.2.4. When the age too is the same, then the candidate who has submitted his application earlier to the Commission, as determined from the application number, shall be placed above in the merit list.

5.3. Onscreen certificate verification will be conducted before admission to the physical certificate verification and counselling. The Commission will draw a list of candidates to be qualified for the onscreen certificate verification based on the criterion of minimum qualifying marks as mentioned in para 6 of the notification and rule of reservation of appointments. The candidates will be admitted to onscreen certificate verification in the ratio of 1:3 / 1:2 for General category and all reserved categories respectively.

5.4. After onscreen certificate verification, based on the marks obtained in the written examination and subject to the rule of reservation of appointments, candidates will be admitted to physical certificate verification and counselling (wherever applicable). For the posts requiring counselling, the candidates will be admitted to physical certificate verification and counselling in the ratio of 1:3 and 1:1.5 for General category and all reserved categories respectively. For the posts not requiring counselling, candidates will be admitted to physical certificate verification in the ratio of 1:1.2 for all categories.

5.5. In respect of posts whose total cadre strength is one only and for which the rule of reservation of appointments does not apply, the number of candidates to be admitted to the physical certificate verification and counselling (wherever applicable) on the basis of the marks obtained in the written examination will be three.

5.6. The final selection will be made based on the total marks obtained by the candidate in the Examination (Part B and Part C of Paper I and Paper II) subject to rule of reservation of appointments. Candidates will be allowed to participate in counselling (wherever applicable) based on his/her rank.

5.7. Appearance in Paper I and Paper II is compulsory. Candidates who have not appeared either for Paper I or Paper II will not be considered for selection, even if they secure the minimum qualifying marks.

6. Scheme of Examination:

6.1. Posts other than Translator and Assistant Section Officer (Translation):

Subject	Standard	No. of Questions	Duration	Maximum Marks	Minimum Qualifying Marks		Type of Examination	Mode of Examination
					SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs	Others*		
Paper I	SSLC	100	3 hours	150	60	60	Objective	OMR
Part A Tamil Eligibility Test								
Part B General Studies								
Part C Aptitude and Mental Ability	Degree	75		150	135	180		
	SSLC	25						
Paper II Subject Paper	Degree / PG Degree	200	3 hours	300				CBT
Total (Part B and Part C of Paper-I and Paper-II)				450				
*Others - Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs								
OMR - Optical Mark Recognition; CBT - Computer Based Test								

6.1.1 Paper II – Subject Paper					
Name of the Post	Post Code	Subject Paper	Subject Code	Standard	Language of Question Paper
Assistant Engineer (Civil)	3270	Civil Engineering	398	Degree	Tamil and English
Assistant Engineer (Civil)	3531				
Assistant Engineer (Civil)	1656				
Assistant Engineer (Civil)	3663				
Assistant Engineer (Civil)	3368				
Assistant Engineer (Civil)	3232				
Assistant Engineer	1661				
Assistant Engineer	1660				
Junior Planner	3602	Town Planning, Civil Engineering and Architecture	560	Degree	English
System Manager	3664	Computer Science, Information Technology, Electrical, Electronics and Communication Engineering	554	Degree	English
Assistant Engineer (Civil)	3603	Civil Engineering, Traditional Architecture and Sculpture	510	Degree	Tamil and English
Assistant Sthapathi	3527	Traditional Architecture and Sculpture	511	Degree	Tamil
Executive Officer, Grade I	1653	Hindu Religion and Law	488	Degree	Tamil and English
Assistant Engineer (Agricultural Engineering)	1667	Agricultural, Mechanical, Automobile and Civil Engineering	562	Degree	English
Junior Electrical Inspector	1666	Electrical and Electronics Engineering	400	Degree	English
Assistant Engineer (Electrical)	3532				
Assistant Engineer (Electrical)	3610				
Assistant Engineer (Electrical)	3678				
Agricultural Officer (Extension)	1678	Agriculture	491	Degree	English
Assistant Director (Industrial Safety and Health)	1664	Industrial Safety and Health	515	Degree	English
Inspector of Fisheries	1759	Fisheries Science and Zoology	559	Degree	English
Assistant Engineer	3269	Environmental and Chemical Engineering	393	PG Degree	English
Environmental Scientist	3606	Environmental Science, Biology and Chemistry	557	PG Degree	English
Research Assistant	1861	Evaluation and Applied Research	213	PG Degree	English

Statistical Inspector	1697	Statistics and Mathematics	505	Degree	Tamil and English
Computer-cum-Vaccine Store Keeper	3201				
Junior Manager (Personnel Administration)	3613	Human Resource Management	572	PG Degree	Tamil and English
Junior Manager (Finance and Accounts)	3352	Financial and Cost Accountancy	433	Intermediate	English
Senior Accountant	3702				
Junior Manager (Technical)	3608	Financial and Cost Accountancy	434	Final	English
Assistant Superintendent of Vigilance Institutions	2086	Criminology, Forensic Science, Psychology and Philosophy	571	Degree	English
Assistant Manager (Mines)	3274	Mining Engineering	347	Degree	English
Mining Engineer	3612				
Statistical Assistant	3125	Statistics and Mathematics	506	PG Degree	English
Computer Programmer	3605	Computer Science, Computer Application and Information Technology	556	PG Degree	English
Executive (P&A)	3604	Personnel Management, Industrial Relations, Business Administration and Social Work	561	PG Degree	English
Assistant Engineer (Mechanical)	3611	Mechanical, Production and Manufacturing Engineering	399	Degree	Tamil and English
Community Officer	3701	Social Work	370	PG Degree	Tamil and English
Assistant Statistical Investigator	1824	Statistics, Mathematics and Economics	504	Degree	Tamil and English
Librarian	1854	Library and Information Science	266	Degree	Tamil and English
Librarian Grade II	3607				
Junior Chemist	3609	Chemistry	430	Degree	Tamil and English
Assistant Tourist Officer, Grade II	3111	Travel and Tourism	353	Degree	English
Project Officer	3614	Mining Engineering and Geology	573	Degree	English
Junior Scientific Officer	1767	Physics, Chemistry, Biology, Computer Science and Forensic Science	575	PG Degree	English

6.2. Translator Post:

Subject	Standard	No. of Questions	Duration	Maximum Marks	Minimum Qualifying Marks		Type of Examination	Mode of Examination
					SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs	Others*		
Paper I	SSLC	100	3 hours	150	60	60	Objective	OMR
Part A Tamil Eligibility Test								
Part B General Studies								
Part C Aptitude and Mental Ability	SSLC	25		150	75	100		
Paper II Translation	Degree	-	2 ½ hours	100			Descriptive	-
Total (Part B and Part C of Paper-I and Paper-II)				250				
*Others - Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs								
OMR - Optical Mark Recognition								

6.3. Assistant Section Officer (Translation) Post:

Subject	Standard	No. of Questions	Duration	Maximum Marks	Minimum Qualifying Marks		Type of Examination	Mode of Examination
					SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs	Others*		
Paper I	SSLC	100	3 hours	150	60	60	Objective	OMR
Part A Tamil Eligibility Test								
Part B General Studies								
Part C Aptitude and Mental Ability	SSLC	25		150	135	180		
Paper II Translation and Precis Writing	Degree	-	3 hours	300			Descriptive	-
Total (Part B and Part C of Paper-I and Paper-II)				450				
*Others - Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs								
OMR - Optical Mark Recognition								

6.4. The Paper II, Part B and Part C of Paper-I will be evaluated only if the candidate secures minimum qualifying marks of 40% (i.e., 60 Marks) in Part A of Paper I.

6.5. The questions in Part B and C of Paper I will be set both in English and Tamil.

6.6. The differently abled candidates can avail exemption from writing Part A in Paper I (Tamil Eligibility Test). Such candidates have to furnish the required details in the online application without fail. Subsequent claim will receive no attention. The candidates need to upload the Certificate of Disability in the format prescribed in Annexure II of this notification.

6.7. The syllabus for the written examination is available in Annexure III of this Notification. Unit-wise distribution of questions mentioned in the syllabus is only indicative. Commission reserves the right to marginally increase or decrease the number of questions in each unit if necessity arises.

6.8. The instructions to be followed while appearing for the examination, are available in Annexure IV of this Notification.

6.9. The Notification is published in English and Tamil versions. In case of doubt, English version is final.

7. Reservation of Appointments:

The rule of reservation of appointments applies to this recruitment. The details of the reservation to candidates belonging to various categories are given in Annexure II of this Notification. In respect of posts whose total cadre strength is one only, the rule of reservation of appointment does not apply.

8. Communication to Candidates:

8.1. The memorandum of admission (Hall Ticket) for eligible candidates will be made available on the Commission's website www.tnpscexams.in for downloading by candidates. The memorandum of admission will not be sent by post. The candidates must comply with every instruction given in the memorandum of admission.

8.2. The Commission will publish the written examination results, date and time of physical certificate verification, and counselling on the Commission's website www.tnpsc.gov.in. No individual communication will be sent to the candidates by post. Candidates will be informed of the above fact only through SMS and e-mail, through the registered Mobile Number and email ID. Candidates are directed to watch the Commission's website in this regard. The Commission shall not be responsible if the communication does not reach the candidate due to an incorrect / invalid e-mail ID /mobile number and failure / delay in delivery of SMS / email to the candidates due to any reason including technical issues. Any representation from the candidates for non-receipt of SMS or e-mail will not be responded.

9. Communication with the Commission:

9.1. Candidates requiring clarification, can contact the office of the Tamil Nadu Public Service Commission in person or over the **Toll-Free No.18004190958** on all working days between 10.00 a.m. and 5.45 p.m.

9.2. Queries relating to One Time Registration / online application may be sent to helpdesk@tnpscexams.in. Any other communication with the Commission must be made through email to grievance.tnpsc@tn.gov.in. Communications sent by post must be addressed only to the Secretary, Tamil Nadu Public Service Commission, TNPSC Road, V.O.C. Nagar, Park Town, Chennai -600003.

9.3. All communications to the Commission should invariably contain the following particulars. Communications not containing the following particulars will not be attended to

- a. Name and Year of the examination
- b. Notification No. and year
- c. Registration No.
- d. Name of the Candidate (in full and in block letters)
- e. Complete postal address as given in the application
- f. Valid and Active E-mail ID

9.4. Request for exemption from age limit or other qualifications will receive no attention. Requests for furnishing causes of failure in the written examination or for non-selection based on the results of the written examination or for revaluation of answer sheets will not be entertained.

10. Litigations:

The selection for appointment to the posts included in this recruitment is purely provisional subject to the final orders in the court cases, if any, pending before the Hon'ble High Court of Madras and Madurai Bench of Madras High Court, relating to this recruitment.

Secretary

Annexure I

How to Apply Online

1. **Website:** Candidates should apply only through online mode in the Commission's website viz., www.tnpscexams.in.

2. One Time Registration:

2.1. It is essential for the candidate to register himself / herself first at the One Time Registration (OTR) platform, available on the Commission's website, and then proceed to fill up the online application for the examination. Candidates should register only once in the One Time Registration by paying Rs.150/- as registration fee. Successfully registered One Time Registration is valid for five years from the date of registration.

2.2. During One Time Registration, the candidates should keep ready the scanned image of their photograph, taken within the last 3 months of size 20 KB – 50 KB and saved as "Photograph.jpg" and signature of size 10 KB – 20 KB and saved as 'Signature.jpg'. Both photograph and signature, of 200 DPI resolution, should be saved in a CD / DVD / Pen drive, to upload the same.

2.3. One Time Registration is not an application for any post. It is just a collection of information from the candidates and provides a separate dashboard to each candidate to facilitate the maintenance of their own profile. A candidate should make an online application separately for every examination for which he / she intends to appear.

2.4. A valid e-mail ID and mobile number are mandatory for One Time Registration. E-mail ID and mobile number are to be kept in 'ACTIVE' mode. Every candidate should have his / her email ID and password. No candidate should share his/her e-mail ID, password, mobile number with any other person. In case a candidate does not have a valid personal email ID, he / she should create a new email ID before applying online and must maintain that email account live. Inquiries relating to One Time Registration / online applications will be answered only if the inquiries are received through a registered e-mail ID.

2.5. Linking the Aadhaar number with One Time Registration (OTR) is mandatory for candidates. The information associated with the Aadhaar number including biometrics will be used only for identification purposes and will not be stored or shared. Candidates are requested to give their consent in their respective OTR. The Aadhaar details will be submitted to the Central Identities Data Repository (CIDR) only for authentication. Linking of the Aadhaar number is mandatory for all prospective candidates to create new OTR, renew / access the existing OTR and apply for any recruitment to be notified henceforth.

2.6. Details to be furnished during One Time Registration:

2.6.1. Candidates shall furnish their correct SSLC Register Number and Certificate Number, Month and Year of Passing, Medium of Instruction, and Name of the Board that issued the certificate while registering online. If any detail furnished is found to be wrong, the online application will be rejected at any stage after due process.

2.6.2. Candidates who have more than one SSLC mark sheet, should enter the details available in the mark sheet issued on the final attempt in which he / she had passed the SSLC examination.

2.6.3. Besides details related to SSLC, all other details required in the One Time Registration, shall be furnished without any mistake, as these details shall form the basis of all other details given subsequently by the candidate while filling the online application for each recruitment.

2.7. One-Time Registration (OTR) Edit:

2.7.1. The candidates shall be permitted to edit the details in the OTR whenever required by uploading the supporting documents.

2.7.2. Any changes in the One Time Registration must be made before the submission of the online application since the details furnished in the One Time Registration will be filled in automatically in the online application. Hence, incorrect particulars furnished in the One Time Registration may result in the rejection of online application after due process. Candidates are therefore advised to fill in the One Time Registration particulars carefully and correctly.

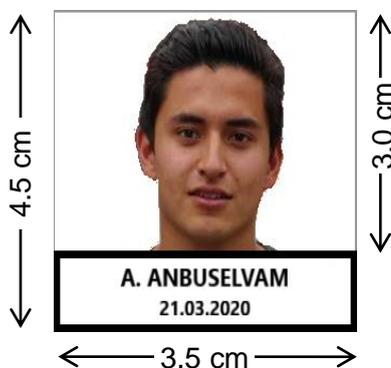
2.7.3. The Commission will not be responsible for any consequences arising out of failure on the part of the candidates to adhere to the instructions issued regarding One Time Registration or filling up of online application.

2.7.4. The instructions and illustration regarding One Time Registration are available on the website viz., www.tnpscexams.in.

3. Online Application:

3.1. A candidate who wishes to apply for any post shall click “APPLY” against the post notified on the Commission’s website and use the same User ID and Password given for One Time Registration. User ID and Password are to be created by the candidates themselves. In case the candidate forgets the User ID and Password, he/she can retrieve or reset them using the “FORGOT PASSWORD and FORGOT USER ID” options. The Commission will not furnish User ID and Password details to the candidates.

3.2. A candidate already having user ID and password, has to login. The available One Time Registration particulars will be displayed on the screen, including the photograph furnished at the time of One Time Registration, as well as the photographs uploaded with previous online applications. Candidates shall check and confirm the One Time Registration details before proceeding further. Thereafter, the candidates shall fill up additional details required in the specific recruitment application. If any of the One Time Registration details are found to be incorrect, the same should be corrected by clicking on OTR Edit. Changes made in the One Time Registration will be reflected only in online applications to be submitted subsequently.



3.3. Candidates shall upload their photograph taken on or after the date of notification at the time of submission of each and every online application. The photograph should be in colour, of passport size, against a white background and taken in a photo studio. The candidate should be photographed in frontal view showing both ears and part of the neck. The candidate should ensure that the name of the candidate and the date of photography (i.e., on or after the date of notification) are printed at the bottom of the photograph. The face of the candidate as well as his / her name and date of photography should be clearly visible in the photograph of height 4.5 cm (170 pixels) and width 3.5 cm (130 pixels). Of the total height of the photograph, the image of the candidate shall be 3.0 cm (115 pixels) and the candidate’s name and date of photography shall be 1.5 cm (55 pixels), as illustrated above. The photograph should be saved in a digital format (in CD / DVD / pen drive / hard drive), ready for uploading.

3.4. If the photograph is not available in a digital format, a passport-size photograph showing the image of the candidate along with the name of the candidate and the date of photography printed at the bottom, in the same dimensions as specified above, may be pasted on a plain white paper and

scanned to obtain a resolution of 200 DPI. The image should then be cropped to show only the photograph of size 20KB–50KB saved as “Photograph.jpg” and uploaded. The entire sheet of white paper on which the photograph is pasted should not be scanned / uploaded. Photographs taken using cellular phones, selfies, photocopies (Xerox) of photographs, photographs taken during family functions, at tourist places, or against a backdrop of plants or buildings should not be uploaded. Photographs of nature, wildlife, buildings, etc. shall not be uploaded. In case of uploading an inappropriate photograph, in violation of the aforementioned instruction, the application is liable to be rejected after due process.

3.5. Before uploading of signature, the candidate shall draw a box of dimension 6.0 x 2.0 cm (230 pixels x 75 pixels) on white paper and sign within the box, using a blue or black ink pen. The paper should then be scanned to obtain a resolution of 200 DPI. The image should then be cropped to show only the box with the signature, of size 10 KB –20KB, and saved as “Signature.jpg” and uploaded.

3.6. Clear images of the photograph and the signature should be uploaded in the correct dimensions, size, and format. Failure to upload/upload clear images of the photograph and signature will result in the rejection of the online application after due process.

3.7. Examination Centres:

3.7.1. While applying online, candidates shall be permitted to choose two district centres as their preference for the Written Examination. Candidates shall be allotted a venue in one of these two district centres. However, candidates with benchmark disability, shall be permitted to choose only one district centre and shall be allotted a venue in that district centre.

3.7.2. Candidates must appear for the examination at the venue they have been allotted, as mentioned in the memorandum of admission (hall ticket). Request for change of examination centre will not be permitted.

3.7.3. The Commission reserves the right to increase or decrease the number of examination centres and to re-allot the candidates accordingly. The Commission also reserves the right to allot a candidate to the nearby centre, if he / she could not be accommodated in the centres opted by the candidate.

3.7.4. The written examination will be held at the centres given below:

S.No.	Name of the Centre	Code	S.No.	Name of the Centre	Code
1.	Ariyalur	3001	21.	Ranipet	3501
2.	Chengalpattu	3301	22.	Salem	1701
3.	Chennai	0101	23.	Karaikudi	1805
4.	Coimbatore	0201	24.	Tenkasi	3601
5.	Chidambaram	0303	25.	Thanjavur	1901
6.	Dharmapuri	0401	26.	The Nilgiris	1301
7.	Dindigul	0501	27.	Theni	2001
8.	Erode	0601	28.	Thiruvallur	2101
9.	Kallakurichi	3401	29.	Thiruvannamalai	2201
10.	Kancheepuram	0701	30.	Thiruvarur	2301
11.	Nagercoil	0801	31.	Thoothukudi	2401
12.	Karur	0901	32.	Tiruchirappalli	2501
13.	Krishnagiri	3101	33.	Tirunelveli	2601
14.	Madurai	1001	34.	Tirupathur	3701
15.	Mayiladuthurai	3801	35.	Tiruppur	3201
16.	Nagapattinam	1101	36.	Vellore	2701
17.	Namakkal	1201	37.	Villupuram	2801
18.	Perambalur	1401	38.	Virudhunagar	2901
19.	Pudukkottai	1501			
20.	Ramanathapuram	1601			

3.8. Application Preview:

3.8.1. Candidates should carefully fill in the details in the online application at the appropriate places and click on the 'SAVE AND PROCEED' button at the end of each page of the application. Before pressing the 'SAVE AND PROCEED' button, candidates are advised to verify each particular field in the application.

3.8.2. Candidates can edit/add/delete any information while filling the online application. Before finally submitting the application, candidates will be given the option of seeing a preview of their application. As soon as a candidate clicks the button meant for preview, an SMS will be sent to the registered mobile number, informing the availability of such a preview in the registered email ID provided by the candidate.

3.8.3. Once the candidate desires to make modifications based on the preview arrangement as indicated in the paragraph above, he/she may re-open the application and make necessary modifications using the Edit option and make the final submission of the corrected application, before the last date prescribed for submission of the online application. It is the responsibility of the candidate to carefully check the details available in the preview and make suitable corrections, if any, in the application / OTR before final submission. The candidate will be solely responsible for any non-rectification or non-submission of the application.

3.8.4. An individual is considered to have applied for a recruitment, if and only if, he / she finally submits the application, by clicking the 'SUBMIT' button. The mere availability of a preview shall not be tantamount to "having applied" for a particular recruitment.

3.9. Examination Fee:

3.9.1. The examination fee of Rs. 100 (Rupees One hundred only) should be paid at the time of submitting the online application for this recruitment, unless exemption of fee is claimed.

3.9.2. For every additional subject paper opted by the candidate in the online application Rs.100 for each subject paper should be paid additionally. Further, if he/she withdraws one or more subject paper(s) then the fee already paid by the candidate will not be refunded.

3.9.3. Candidates belonging to special categories can avail of exemption from paying examination fees as per eligibility criteria. For further details refer to Annexure II of this Notification.

3.9.4. The total number of free chances availed, will be calculated based on claims made in previous applications. The number of free chances availed by the candidate may be verified by the Commission at any stage of the selection process. In case a candidate makes a false claim for exemption from payment of the application fee by suppressing information regarding his/her previous application(s), his / her candidature shall be rejected after due process and he / she shall be debarred for a period of one year, from appearing for examinations conducted by the Commission.

3.9.5. Candidates are directed to carefully choose the option "Yes" or "No" regarding availing of the fee concession. The choice made, cannot be modified or edited after successful submission of the online application. Candidates are advised in their own interest, to keep an account of the number of times fee concession has been availed, irrespective of the information displayed in the <Application History> of the candidate dashboard.

3.9.6. An application (irrespective of the post applied for) claiming fee concession will operate to exclude one chance from the number of free chances allowed. Candidates who have availed the maximum number of free chances permitted / candidates who do not wish to avail of the fee concession / candidates who are not eligible for fee concession shall choose the option "No" against the query regarding fee concession. Such candidates shall thereafter pay the requisite fee through the prescribed mode of payment.

3.9.7. Failure to pay the prescribed fee in time, along with the online application, will result in the rejection of the application after due process.

3.10. Examination Fee Payment:

3.10.1. After submitting the details in the online application, the candidates can pay the examination fee by online mode through Net Banking / Credit card / Debit card / UPI on or before the last date of submission of the online application by choosing the option in the online application. Candidates have to pay the service charges also as applicable.

3.10.2. Offline mode of payment if any received in the form of Demand Draft / Postal Order etc. will not be accepted and the applications forwarded with such modes of payment will be summarily rejected and the same will not be returned or refunded.

3.10.3. To facilitate payment of fees through the online mode, an additional page of the application format will be displayed wherein candidates may follow the instructions and fill in the requisite details to make payment. There is a possibility of online payment failure. Hence, if the online payment fails, candidates can check the status of the earlier transaction. If the earlier transactions have failed, the candidate shall retry paying the fee again by online mode. In case of online payment failure, the amount debited from the candidate's account will be reverted to his/her account. The candidates have been given a provision to check the status of the transaction made. If all the attempts/transactions have failed, candidates have to make the payment again. The Commission is not responsible for online payment failure. It is the responsibility of the candidates to ensure that the transaction made by them is successful.

3.10.4. After submitting the payment information in the online application format, wait for the intimation from the server. Meanwhile, DO NOT press 'Back' or 'Refresh' button to avoid payment failure or double payment.

3.10.5. If the online transaction has been successfully completed, an Application Number / Applicant ID will be generated. Candidates should note the Application Number / ID for future reference in respect of the recruitment applied for.

3.10.6. Tamil Nadu Public Service Commission reserves the right to change the mode of payment at any time.

3.11. Online Application Edit:

3.11.1. The candidates shall be permitted to edit all the details in the online application till the last date stipulated for submission of the online application.

3.11.2. If the candidate desires to change his / her photograph and/or signature in his / her online application, the candidate shall select the edit option in the online application to re-upload them which must be saved finally before submitting the online application.

3.11.3. Some of the information contained in the online application has been brought forward from the candidate's one-time registration. If such information has to be edited in the online application, the candidate shall select the edit profile option in One Time Registration (OTR) and shall make and save necessary corrections. After doing so, the candidate shall select the edit option in the online application and edit the details as desired. The candidate shall save the changes and submit it finally. The candidate shall take a printout of the same if required.

3.11.4. After editing the online application, if the edited details are not finally saved and submitted by the candidate, the details provided by the candidate in the application submitted before editing shall only be considered. If the candidate has to pay a fee based on the edited details, the candidate shall pay the prescribed examination fee in online. Candidates who have already paid the examination fee are not required to pay.

3.12. Application Correction Window:

3.12.1. After the last date for submission of the online application, the Online Application Correction Window shall open for 3 days as mentioned in Para 1 'Important Instructions' of this Notification. During this period, candidates will be able to edit the details in their online application. After the last date of the Correction Window period, no modification is allowed in the online application.

3.12.2. The applications shall be processed as per the details finally furnished by the candidates. It is the responsibility of the candidates and the Commission has no liability for subsequent rejection of the application consequent to the editing details already submitted in the online application. Request / representation received for modification of claims in the online application, in any mode shall not be entertained.

3.13. Candidates are advised in their own interest to apply online much before the closing date and not to wait till the last date to avoid the possibility of disconnection / inability / failure to log on to the Commission's website on account of heavy load on internet / website.

3.14. The Commission does not assume any responsibility for the candidates not being able to submit their online applications within the last date on account of the aforesaid reasons or for any other reason beyond the control of the Commission.

3.15. Candidates need not send the printout of the online application or any other supporting documents to the Commission by post unless asked for specifically.

3.16. The name of the candidate or the name of his / her father or mother, should be spelt correctly in the application as it appears in the certificates / mark sheets.

3.17. Any discrepancy between the details as given in the online application and the documents submitted shall result in the summary rejection of candidature after due process.

3.18. The Commission will not be responsible for any consequences arising out of furnishing of incorrect and / or incomplete details in the application or omission to provide the required details in the application.

3.19. Upload of Documents:

3.19.1. Candidates should upload the required documents of proof in respect of all the claims made in the application with reference to this notification while applying for this examination. If the required certificates are not uploaded by the candidate, within the stipulated time, his/her candidature will be rejected after due process.

3.19.2. The candidates shall have the option of verifying the uploaded certificates / documents through their OTR. If any of the certificates / documents have wrongly been uploaded or not uploaded or if any modifications are to be done in the uploading of documents, the candidates shall be permitted to upload / re-upload the documents till two days prior to the date of hosting of hall tickets for that particular examination. (i.e., twelve days prior to the date of examination).

3.19.3. The uploaded credentials shall be mapped with the One Time Registration of the respective candidate along with the Application number and Notification Number (i.e., with reference to the notification for each post), so that they can be used during future submission of application by the same candidates.

3.19.4. The documents uploaded by the candidates shall be linked with OTR and retained in the server for a maximum period of two years. If the candidate applies subsequently for other posts within two years, the documents that were already uploaded shall be displayed to the candidate during the online application process for confirmation and the same need not once again be uploaded by the candidates. If the candidate applies to other posts after the period of retention i.e. two years, the candidate shall be instructed to upload all the documents afresh.

4. Information regarding criminal cases / disciplinary cases:

4.1. Candidates who have declared pending criminal or disciplinary cases in their online application, must upload a copy of the First Information Report (FIR) or memorandum of charges / show cause notice, as the case may be. Failure to upload such papers at the time of submission of online application, shall result in rejection of candidature after due process.

4.2. Candidates who have declared conviction in criminal cases or punishment in disciplinary cases, in their online application, must upload the relevant court orders and / or release orders or memorandum of proceedings, as the case may be, at the time of submission of online application. Failure to upload such papers shall result in the rejection of candidature after due process.

4.3. In case any criminal case is filed / disciplinary action is taken against or conviction / punishment is imposed on a candidate after submission of the online application, at any stage of the recruitment process before the completion of the entire selection process, such candidates should report this fact to the Commission in the next immediate stage when Commission calls for uploading documents. Failure to comply with these instructions shall result in the rejection of candidature after due process and debarment for a period of one year.

4.4. The pendency of disciplinary cases / criminal cases shall in no way affect the selection prospects of candidates. However, failure to inform such pendency, shall result in the rejection of candidature after due process.

4.5. The selection of the candidates against whom the criminal case / disciplinary case is pending, will be withheld subject to the outcome of the pending criminal / disciplinary case.

5. Employment Details:

5.1. Candidates who are in the service of the Indian Union or a State in India or in the employment of Local Bodies or Universities or Quasi Government Organizations or Public Sector Units constituted under the authority of the Government of India or of a State in India, in regular service, must inform the Commission of such fact, at the time of applying. Suppression of the fact of employment by candidates shall result in rejection of candidature after due process.

5.2. Candidates need not send their applications through their Head of Department or employer. Instead, they may directly apply to the Commission after duly informing their employer in writing that they are applying for the particular recruitment, subject to the condition that they should produce 'No Objection Certificate' in the format prescribed as shown below.

No Objection Certificate

This is to certify that Thiru/Tmt./Selvi. (Name) employed as (designation) in this office from(specify the date from which appointed), who is regularly / temporarily appointed and who is as probationer / approved probationer / full member, had applied for the post ofinservice called for by the Tamil Nadu Public Service Commission through online application form to the Tamil Nadu Public Service Commission and informed the fact to this department / organisation. This department / organisation has 'no objection' for processing the said application of the individual by the Tamil Nadu Public Service Commission subject to the condition that the particulars furnished by the individual are found to be correct.

Appointing Authority
(Signature with Seal)

* In the case of a Government servant against whom departmental or criminal proceedings are contemplated or pending, the appointing authority shall inform the said fact to the Tamil Nadu Public Service Commission along with the "No Objection Certificate" and shall also inform the Tamil Nadu Public Service Commission about the initiation of departmental or criminal proceedings, if any,

subsequently, till the date of his / her actual relief from the office to take up appointment in the post for which he / she has been selected.

5.3 Candidates who secure employment after submission of online application, must upload a 'No Objection Certificate' or at least an undertaking regarding the fact of employment and that 'No Objection Certificate' has been applied for. Failure to upload the 'No Objection Certificate' / an undertaking shall result in the rejection of candidature after due process.

5.4. Candidates who have been removed / dismissed / resigned from a post, shall intimate such fact to the Commission, through the One Time Registration Dashboard. Any failure in this regard shall result in the rejection of the candidature after due process.

5.5. Any change in the employment status of the candidate, whether appointment to or resignation / removal / dismissal, from a post, at any stage of the recruitment process, until completion of the entire selection process, must be informed to the Commission. Any failure in this regard shall result in the rejection of the candidature after due process.

5.6. Failure on the part of employed candidates to upload the 'No Objection Certificate' shall result in the rejection of candidature after due process.

Annexure II

1. Ex-Servicemen:

1.1. 'Ex-Serviceman' means,

1.1.1. any person who had served in any rank (whether as combatant or not) in the Armed Forces of the Union for a continuous period of not less than six months after attestation, if released between 1st July 1979 and 30th June 1987 (both days inclusive):

- a. for reasons other than at his own request or by way of dismissal or discharge on account of misconduct or inefficiency; or
- b. at his own request after serving for a period of not less than five years; or

1.1.2. any person who had served in any rank (whether as combatant or not) in the Armed Forces of the Union, and had retired or had been released on or after 1st July 1987 from such service:

- a. at his own request after earning his pension; or
- b. on medical grounds attributable to military service or circumstances beyond his control and awarded medical or other disability pension; or
- c. otherwise than at his own request after earning his pension, as a result of reduction in establishment; or
- d. after completing specific period of engagement, otherwise than at his own request or by way of dismissal or discharge on account of misconduct or inefficiency and has been given a gratuity.

1.1.3. any person of the Territorial Army of the following categories, namely, pension holder for continuous embodied service, person with disability attributable to military service and gallantry award winner retired on or after 15th November 1986; or

1.1.4. any person of the Army Postal Service, who retired on or after 19th July 1989 directly from the said service without reversion to Postal and Telegraph Department with pension or who has been released on or after 19th July 1989 from such service on medical grounds attributable to military service or circumstances beyond his control and awarded medical or other disability pension; or

1.1.5. any person who was on deputation in the Army Postal Service for more than 6 months prior to the 14th day of April 1987; or

1.1.6. any person who was boarded out or released on medical grounds and granted medical or disability pension; or

1.1.7. any person discharged on or after July 1987 under Army Rule 13(3) III (V) for the reason that his service is no longer required and in receipt of pension; or

1.1.8. such other person as may be notified by the Government from time to time.

1.2. Ex-Servicemen does not mean the wards / dependants of those mentioned above.

1.3. A person discharged before July 1987 under Army Rule 13(3) III (V) for the reason that his service is no longer required is not an Ex-Serviceman.

1.4. In all cases, an Ex-Serviceman once recruited to a post in any class or service or category, cannot claim the concession of being called an Ex-Serviceman for his further recruitment.

1.5. Persons serving in the Armed Forces shall be eligible to apply for posts under the Government, if they are due to complete the specified term of their engagement in the Armed Forces, within one year from the last date prescribed by the Commission, for receipt of the online application in respect of a particular recruitment.

1.6. Fee Concession: Two free chances.

1.7. Reservation of Appointments: The rule of reservation of appointment to Ex-Servicemen is applicable only for the posts upto Level 12 in the Pay Matrix in the notification. If no qualified and suitable Ex- Servicemen belonging to a particular category is available for selection for appointment against reserved turn, such turn shall be filled up by a candidate other than Ex-Servicemen belonging to the particular communal category.

1.8. Supporting Documents:

1.8.1. A candidate who claims to have been demobilised from the Army or Navy or Air Force needs to upload either a properly authenticated extract from his Discharge Certificate (viz., a Bonafide Certificate) issued by the Ex-Servicemen's Welfare Board in the format as depicted below or the Pension Pay Order at the time of submission of online application.

Form of Bonafide Certificate to be produced by Ex-Servicemen

1. Name of the applicant
2. Rank held, Name of the Service (Army / Navy / Air force)
3. Date of enrolment
4. Date of discharge
5. Reasons for discharge
6. Whether an 'Ex-Serviceman' should be specifically stated
7. Whether in receipt of pension
8. P.P.O No.
9. Conduct and character while serving in the defence forces
10. Name of the post applying for
11. Unique Service No.
12. Whether the individual is employed in any post under the Government of Tamil Nadu? If so, Name of the post and date of appointment

1.8.2. Persons serving in the Armed Forces who are due to complete the specified term of their engagement in the Armed Forces, within one year from the last date prescribed by the Commission, for receipt of the online application in respect of this recruitment, shall upload at the time of submission of online application an undertaking and a certificate from their Commanding Officer in the format as depicted below.

Form of Undertaking to be given by the Serving Personnel

I hereby accept that if selected on the basis of the recruitment / examination to which this application relates, I will produce documentary evidence to the satisfaction of the appointing authority that I have been duly released / retired / discharged from the Armed Forces and I am entitled to the benefits admissible to Ex-Servicemen given under Section 63 of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

Place:

Signature of the Applicant

Form of Certificate for Serving Personnel

I hereby certify that according to the information available with me (Number)(Rank)
(Name) is due to complete the specified term of his engagement with the Armed Forces on the (date)
.....

Place:

Signature of the Commanding Officer

Date:

1.8.3. The candidates should also submit the Self Declaration in the format given below.

Self Declaration

1) I am aware of the fact that, as per the proviso to Section 3 (j) and 3(y) of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016 (Tamil Nadu act 14 of 2016) and as per note II under para.4-A of the Commission's Instructions to Applicants, "In all cases, an ex-serviceman once recruited to a post in any class or service or category, cannot claim the concession of being called an ex-serviceman for his further recruitment".

2) I am also aware of the fact that as per para.14(P)(V) of the Commission's Instructions to Applicants "Any change in the employment status of the candidate, whether appointment to, or resignation / removal / dismissal, from a post, at any stage of the recruitment process, until completion of the entire selection process, must be informed to the Commission. Any failure in this regard shall result in rejection of candidature after due process"

3) Knowing the above facts, I (Ex.No.....) Ex.Rank.....
NameofDistrict hereby declare that I have never been employed in any post in any class or service or category classified under State service or Subordinate service of Tamil Nadu.

4) Knowing the above facts, I (Ex.No.....) Ex.Rank.....
Nameof.....District hereby declare that I have been employed in State service or Subordinate service of Tamil Nadu asfrom.....to.....after my retirement from the Armed Forces. I also enclose herewith the No Objection Certificate obtained from my employer.

5) Further, if the above declaration is found to be false, I may be subjected to any departmental / legal/ penal action as deemed fit and my candidature to the said examination will be cancelled by the Commission after due process.

(*Strikeout whichever is not applicable)

Date :

Signature :

Place :

Name :

Register No. :

Ex. No. :

Rank :

Mobile No. :

1.8.4. Failure to upload the supporting documents, shall result in the rejection of claim after due process.

2. Persons with Benchmark Disability:

2.1. "Person with Benchmark Disability" means a person with not less than forty percent of a specified disability where specified disability has not been defined in measurable terms and includes a person with disability where specified disability has been defined in measurable terms, as certified by the certifying authority designated by the Government under sub-section (1) of section 57 of the Rights of Persons with Disabilities Act, 2016.

2.2. Fee Concession: Full exemption.

2.3. Reservation of Appointments: (For posts identified suitable for persons with benchmark disabilities) Out of the total number of appointments to be made in the communal reservation categories, viz., Scheduled Castes / Scheduled Caste - Arunthathiyars (on preferential basis) / Scheduled Tribes / Most Backward Classes / Denotified Communities / Backward Classes (other than Muslim) / Backward Classes (Muslim) and General Turn, in the case of appointment made by direct recruitment, 1% each shall be reserved for persons with benchmark disabilities under categories (a), (b) and (c) and 1% for persons with benchmark disabilities under categories (d) and (e) both taken together, namely:

- a. blindness and low vision;
- b. deaf and hard of hearing;
- c. locomotor disability including cerebral palsy, leprosy cured, dwarfism, acid attack victims and muscular dystrophy;
- d. autism, intellectual disability, specific learning disability and mental illness;
- e. multiple disabilities from amongst persons under categories (a) to (d) including deaf-blindness in the posts identified for each disability.

2.4. Supporting Documents:

2.4.1. The Persons with Benchmark Disability should produce Disability Certificate at the time of online application in the format shown below, prescribed in the Rights of Persons with Disabilities Rules, 2017 and issued by the competent authority as mentioned below;

**Form V
Certificate of Disability**

(In cases of amputation or complete permanent paralysis of limbs or dwarfism and in case of blindness)

(Name and Address of the Medical Authority issuing the Certificate)

Recent passport size attested photograph (Showing face only) of the person with disability.

Certificate No. _____

Date: _____

This is to certify that I have carefully examined Shri./ Smt./ Kum. _____
 Son / wife / daughter of Shri. _____ Date of Birth (DD/ MM/YY) _____ Age _____
 years, male / female Registration No. _____ permanent resident of House No. _____ Ward /
 Village / Street Post Office _____ District State _____, whose photograph is affixed above,
 and am satisfied that:

(A) he / she is a case of:

- locomotor disability
- dwarfism
- blindness

(Please tick as applicable)

(B) the diagnosis in his / her case is _____

(C) he / she has _____% (in figure) _____ percent (in words) permanent locomotor disability/
 dwarfism/ blindness in relation to his / her _____ (part of body) as per guidelines
 (..... number and date of issue of the guidelines to be specified).

2. The applicant has submitted the following document as proof of residence:-

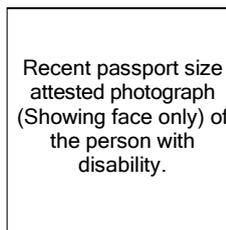
Nature of Document	Date of Issue	Details of authority issuing certificate

(Signature and Seal of Authorized Signature of notified Medical Authority)

Signature/ thumb impression of the person in whose favour certificate of disability is issued.
--

Form VI
Certificate of Disability
(In cases of multiple disabilities)

(Name and Address of the Medical Authority issuing the Certificate)



Certificate No. _____

Date. _____

This is to certify that we have carefully examined Shri./ Smt./ Kum. _____ son/ wife/ daughter of Shri _____ Date of Birth (DD/ MM/ YY) _____ Age _____ years, male/ female _____ Registration No. _____ permanent resident of House No. _____ Ward/ Village/ Street _____ Post Office _____ District _____ State _____, whose photograph is affixed above, and am satisfied that:

(A) he/ she is a case of Multiple Disability. His/ her extent of permanent physical impairment/ disability has been evaluated as per guidelines (..... number and date of issue of the guidelines to be specified) for the disabilities ticked below, and is shown against the relevant disability in the table below:

Sl. No.	Disability	Affected part of body	Diagnosis	Permanent physical impairment/ mental disability (in%)
1.	Locomotor disability	@		
2.	Muscular Dystrophy			
3.	Leprosy cured			
4.	Dwarfism			
5.	Cerebral Palsy			
6.	Acid attack Victim			
7.	Low vision	#		
8.	Blindness	#		
9.	Deaf	£		
10.	Hard of Hearing	£		
11.	Speech and Language disability			
12.	Intellectual Disability			
13.	Specific Learning Disability			
14.	Autism Spectrum Disorder			
15.	Mental illness			
16.	Chronic Neurological Conditions			
17.	Multiple sclerosis			
18.	Parkinson's disease			
19.	Haemophilia			
20.	Thalassemia			
21.	Sickle Cell disease			

(B) In the light of the above, his/ her over all permanent physical impairment as per guidelines (..... number and date of issue of the guidelines to be specified), is as follows : -

In figures :- ----- percent

In words :- ----- percent

2. This condition is progressive/ non-progressive/ likely to improve/ not likely to improve.

3. Reassessment of disability is:

(i) not necessary, or

(ii) is recommended/ after years months, and therefore this certificate shall be valid till --- --- ---

(DD) (MM) (YY)

@ e.g. Left/ right/ both arms / legs

e.g. Single eye

£ e.g. Left/ Right/ both ears

4. The applicant has submitted the following document as proof of residence:-

Nature of document	Date of issue	Details of authority issuing certificate
--------------------	---------------	--

5. Signature and seal of the Medical Authority.

Name and Seal of Member	Name and Seal of Member	Name and Seal of the Chairperson
-------------------------	-------------------------	----------------------------------

Signature/ thumb impression of the person in whose favour certificate of disability is issued.
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Form VII
Certificate of Disability
(In cases other than those mentioned in Forms V and VI)
(Name and Address of the Medical Authority issuing the Certificate)

Recent passport size attested
photograph (Showing face
only) of the person with
disability.

Certificate No. _____

Date. _____

This is to certify that I have carefully examined Shri./ Smt./ Kum. _____ son / wife / daughter of Shri _____ Date of Birth (DD/ MM/ YY) ____ __ __ Age _____ years, male/ female _____ Registration No. _____ permanent resident of House No. _____ Ward/ Village/ Street _____ Post Office _____ District _____ State _____, whose photograph is affixed above, and am satisfied that he/ she is a case of _____ disability. His/ her extent of percentage physical impairment/ disability has been evaluated as per guidelines (..... number and date of issue of the guidelines to be specified) and is shown against the relevant disability in the table below:-

Sl. No.	Disability	Affected part of body	Diagnosis	Permanent physical impairment/mental disability (in %)
1.	Locomotor disability	@		
2.	Muscular Dystrophy			
3.	Leprosy cured			
4.	Cerebral Palsy			
5.	Acid attack Victim			
6.	Low vision	#		
7.	Deaf	€		
8.	Hard of Hearing	€		
9.	Speech and Language disability			
10.	Intellectual Disability			
11.	Specific Learning Disability			
12.	Autism Spectrum Disorder			
13.	Mental illness			
14.	Chronic Neurological Conditions			
15.	Multiple sclerosis			
16.	Parkinson's disease			
17.	Haemophilia			
18.	Thalassemia			
19.	Sickle Cell disease			

(Please strike out the disabilities which are not applicable)

2. The above condition is progressive / non-progressive / likely to improve / not likely to improve.

3. Reassessment of disability is:

(i) not necessary, or

(ii) is recommended/ after ___ years ___ months, and therefore this certificate shall be valid till
(DD/ MM/ YY) _____

@ - eg. Left/ Right/ both arms/ legs

- eg. Single eye/ both eyes

€ - eg. Left/ Right/ both ears

4. The applicant has submitted the following document as proof of residence:-

Nature of Document	Date of Issue	Details of authority issuing certificate
--------------------	---------------	--

(Authorized Signatory of notified Medical Authority)
(Name and Seal)

Countersigned
{Countersignature and seal of the
Chief Medical Officer/ Medical Superintendent/
Head of Government Hospital, in case the
Certificate is issued by a medical authority who is
not a Government servant (with seal)}

Signature/ thumb impression of the person in whose favour certificate of disability is issued.
--

List of Certifying Authority for the issue of disability certificate

TABLE – I

S. No.	Specified disability	Medical Authority for the purpose of the issue of disability certificate	Certifying authority to issue certificate of disability
1	In case of amputation or complete permanent paralysis of limbs or dwarfism	Hospitals/ Institutions/ Primary Health Centres run by Central and State Government/ Statutory Local bodies	Any doctor/ medical practitioner working in the Hospitals/ Institutions/ Primary Health Centres run by Government/ Statutory Local bodies.
2	Multiple Disability	District Hospital/ Other hospitals/ Institutions run by Central and State Government /Statutory Local Bodies having relevant medical specialist and testing/assessment facilities	Medical Board consisting of three members of whom two will be specialist dealing with relevant disabilities
3	Specified Disabilities not mentioned in Serial numbers 1 & 2 above	Hospitals / Primary Health Centers / Institutions run by Central and State Government/ Statutory Local bodies having relevant medical specialist and testing / assessment facilities	A specialist dealing with the relevant disability as specified in the Table - II given below

TABLE – II

Sl. No.	Category	Specialist
1	Locomotor disability other than amputation or complete permanent paralysis of limbs and dwarfism	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
2	Muscular Dystrophy	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
3	Leprosy cured person	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
4	Cerebral Palsy	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
5	Acid Attack Victim	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
6	Blindness	Specialist in the field of Ophthalmology.
7	Low Vision	Specialist in the field of Ophthalmology.
8	Deaf	Specialist in the field of Ear, Nose, Throat (E.N.T).
9	Hard of Hearing	Specialist in the field of Ear, Nose, Throat (E.N.T).
10	Speech and Language Disabilities	Specialist in the field of Ear, Nose, Throat (E.N.T) and Neurologist.
11	Intellectual Disability	Adults with intellectual disability above the age group of 18 years – Psychiatrist.
12	Specific Learning Disabilities	Medical board consisting of a) Paediatrician; and b) Psychiatrist and Trained Psychologist.
13	Autism spectrum disorder	Medical Board consisting of a) Psychiatrist and Trained psychologist; and b) Paediatrician or General Physician.

14	Mental Illness	Psychiatrist.
15	Chronic Neurological Conditions such as Multiple Sclerosis and Parkinson's Disease	Medical Board consisting of a) Psychiatrist and Trained Psychologist; and b) Neurologist; and c) Orthopaedician or Specialist in Physical Medicine and Rehabilitation.

2.4.2. In case the certificate is issued by a medical authority who is not a Government servant, it shall be valid only if countersigned by the Joint Director, Medical Services.

2.4.3. The disability claimed in the online application, shall be exactly the same as stated in the Disability Certificate. Any discrepancy in this regard shall result in rejection of claim after due process.

2.4.4. Claim as person with benchmark disability, unsupported by the prescribed documents shall result in rejection of claim after due process.

3. Destitute Widow:

3.1. "Destitute Widow" means a widow whose total monthly income from all sources shall not be more than Rs.4,000/-(Rupees Four Thousand only), including any family pension or other receipts including income from private practice in the case of professionals. Destitute Widow shall not include a divorcee or a woman deserted by her husband. The status of an individual as Destitute Widow is with reference to the date of notification.

3.2. Fee Concession: Full exemption.

3.3. Reservation of Appointments: The rule of reservation of appointment to Destitute Widow candidates will apply for this recruitment. 10% of vacancies out of 30% of vacancies set apart for Women candidates in direct recruitment are reserved for Destitute Widows. The reservation of appointment to Destitute Widow is applicable only for the post which does not exceed Level-10 in the pay matrix in this notification. If no qualified and suitable destitute widow is available, then, the turn so set apart for destitute widow shall go to the women / Transgender (Women) (other than destitute widow) belonging to the respective category

3.4. Supporting Documents:

3.4.1. The Destitute Widows should upload a certificate from the Revenue Divisional Officer or the Assistant Collector or the Sub-Collector concerned, in the format prescribed below. Failure to upload such certificate or uploading of a widow or divorcee certificate, at the time of submission of online application, shall result in rejection of claim after due process.

Form of Destitute Widow Certificate

1. Name of the individual
2. Full Postal Address
3. Details of job held, if any:
4. Particulars of her children, if any
5. Name and last occupation of her late husband
6. Date of demise of her husband
7. Monetary benefits received after her husband's death by way of family pension, insurance, etc., if any
8. Details of Properties if any immovable and movable left behind by him
9. Present monthly income
 - a. From salaries/wages
 - b. From family pension
 - c. From private properties

- d. Rents received
- e. From private practice
- f. Other sources, if any
- g. Total

10. Whether living alone or living with her husband's parents / in-laws / parents / brother(s)

11. Whether she satisfies the definition of the term "Destitute Widow" as defined in section 20(8) and 26 of Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

Certified that I have verified the particulars furnished by the individual and satisfied myself as to the correctness of her claim with reference to the definition of the term – "Destitute Widow" in section 20(8) and 26 of Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

Certificate Reference No.:

Signature:

Place:

Name:

Date:

Designation:

Revenue Divisional Officer / Assistant Collector / Sub-Collector

Explanation - The above certificate should be issued only by the Revenue Divisional Officer or the Assistant Collector or the Sub-Collector concerned.

3.4.2. A 'Widow Certificate' is different from a 'Destitute Widow Certificate'. Candidates who have uploaded Widow Certificates will not be considered as Destitute Widow.

3.4.3. Claim as Destitute Widow shall be admitted only if the date of demise of husband is on or before the date of notification.

3.4.4. Any correction in the Destitute Widow certificate must be attested by the issuing authority or a fresh certificate in lieu thereof must be uploaded.

4. Person Studied in Tamil Medium (PSTM):

4.1. "Person Studied in Tamil medium" means a person who has studied through Tamil medium of instruction up to the educational qualification prescribed for direct recruitment in the rules or regulations or orders applicable to any appointment in the services under the State.

4.1.1. In cases where a Degree is prescribed as the educational qualification, one shall have studied from first standard to Degree through Tamil medium of instruction.

4.1.2. The candidates who did not join school in the 1st standard, but joined schools directly in 2nd standard to 8th standard, studied with Tamil as the medium of instruction and passed, and those who studied with Tamil as the medium of instruction in other states and then continued their education in Tamil Nadu from the standard they entered are also eligible.

4.1.3. Students who have studied in Tamil medium in regular stream in 10th, 11th and 12th standard and failed to pass one or more subjects in them, but have later passed in the subject as private students and have continued to study in schools and colleges in Tamil medium and have passed are eligible to be considered under PSTM category.

4.1.4. The candidates who have passed the examination through Tamil medium directly as private candidates without going to school are not eligible to be considered under PSTM category.

4.2. Supporting Documents:

4.2.1. Candidates claiming to be Persons Studied in Tamil Medium (PSTM) must upload evidence for the same, in the form of SSLC, HSC, Transfer Certificate, Provisional Certificate, Convocation Certificate, Degree Certificate, PG Degree Certificate, Mark Sheets, Certificate from the Board or University or from the Institution, as the case may be, with a recording that he had studied the entire duration of the respective course(s) through Tamil medium of instruction.

4.2.2. The candidates should obtain certificates of education in Tamil medium from all the relevant educational institutions where they studied upto the prescribed educational qualification. Candidates must upload documents as evidence of having studied in the Tamil medium, all educational qualifications from 1st standard up to the educational qualification prescribed.

4.2.3. If no such document as evidence for 'Person Studied in Tamil Medium' is available, a certificate from the Principal / Head Master / District Educational Officer / Chief Educational Officer / Director , Directorate of Government Examinations / Competent Authority, Principal / Registrar of Industrial Training Institute / College / University as the case may be, in the format as shown below, must be uploaded for each and every educational qualification, from 1st standard up to the educational qualification prescribed.

4.2.4. Failure to upload such documents as evidence for 'Persons Studied in Tamil Medium' for all educational qualification up to the educational qualification prescribed, shall result in the rejection of claim after due process.

4.2.5. Documents uploaded as proof of having studied in Tamil medium, for the partial duration of any course, shall not be accepted and shall result in the rejection of claim after due process.

Certificate for having studied in Tamil Medium*

This is to certify that Thiru./Tmt./Selvi.(Name) had studied Classes to with Tamil as the medium of instruction, in this school / through Private Studies during the year to and had satisfactorily completed the course of studies prescribed for Classes to

Thiru./Tmt./Selvi.(Name) was / was not awarded scholarship meant for students studying in the Tamil medium.

This certificate is issued with reference to Section 2(d) of the PSTM (Amendment) Act, 2020, based on the verifiable documentary evidence. The undersigned assumes full responsibility for the veracity of the contents herein.

Signature of Principal / Head Master /
District Educational Officer /
Chief Educational Officer /
Director, Directorate of Govt. Exams /
Competent Authority

Place:

Date:

Seal of the Institution

(Mobile No. _____)

* If the candidate has studied in different schools from 1st std. up to 10th std./ 12th std., then the above certificate shall be obtained from each of the schools the candidate has studied in.

5.6. Supporting Documents:

5.6.1. The Scheduled Caste (Arunthathiyars) and Scheduled Castes candidates should produce the Community certificate, citing either father's / mother's name, issued by Taluk Tahsildar, in whose jurisdiction the candidate claims to have permanent residence.

5.6.2. The Scheduled Tribe candidates should produce the Community certificate, citing either father's / mother's name, issued by the Revenue Divisional Officer / Assistant Collector / Sub-Collector / Personal Assistant (General) to the Collector of Chennai / District Adi-Dravidar Welfare Officer, in whose jurisdiction the candidate claims to have permanent residence.

5.6.3. Candidates belonging to Scheduled Tribe communities must upload the report of the State Level Scrutiny Committee (SLSC), if available. Failure to do so would render their claim liable to verification by the State Level Scrutiny Committee.

5.6.4. Uploading of a community certificate citing name of the spouse, shall result in rejection of claim after due process.

5.6.5. The certificate obtained by the candidates in the form other than the one referred to in G.O. Ms. No.781, Revenue Department, dated 2nd May 1988 and solely based on the entries in SSLC or Transfer Certificate or other school / college records will not be accepted.

5.6.6. Candidates are warned that if the community recorded in the certificate produced by them from the competent authority is not included in the list of Scheduled Castes, Scheduled Caste (Arunthathiyars), Scheduled Tribes, given in the Annexure to the "Instructions to Applicants" [extracted from the Tamil Nadu Government Servants (Conditions of Service) Act, 2016], they will not be permitted to claim to belong to Scheduled Castes, Scheduled Caste (Arunthathiyars), Scheduled Tribes, as the case may be. They will, in that case, be permitted to claim to belong to 'Others' category only.

5.6.7. Candidates belonging to Scheduled Castes, on conversion to religions other than Christianity / Islam, shall be treated as 'Others'. However, Scheduled Caste converts to Sikhism and Buddhism shall be treated as Scheduled Castes.

5.6.8. Failure to upload the supporting documents, when called for shall result in the rejection of claim after due process.

6. Backward Classes:

6.1. "Backward Classes" means the communities specified as Backward Classes, Backward Class Muslims, Most Backward Classes / Denotified Communities given in the Annexure to the "Instructions to Applicants" [extracted from Parts A, B, C and D respectively, of Schedule-I of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016].

6.2. Explanation - Persons who belong to the State of Tamil Nadu alone, who belong to one of the communities specified in Schedule-I, of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016 shall be treated as persons who belong to one of such communities.

6.3. Fee Concession: Three Free Chances

6.4. **Reservation of Appointments:** The selection will be made following the rule of reservation of appointments for Backward Classes (Muslim), Backward Classes, Most Backward Classes and Denotified Communities.

Backward Class (BC)	26.5%
Backward Class (Muslim) [BC (M)]	3.5%
Most Backward Class / Denotified Communities (MBC / DC)	20.0%

6.5. Supporting Documents:

6.5.1. The candidates belonging to Backward Classes (Muslim), Backward Classes, Most Backward Classes and Denotified Communities should produce the Community certificate, citing either father's / mother's name, issued by Revenue Officer not lower in rank than a Tahsildar or Head Quarters Deputy Tahsildar or Special Deputy Tahsildar appointed to issue Community Certificate or Deputy Tahsildar (School Certificates) or Executive Deputy Tahsildar (in respect of Chennai district) or Additional Head Quarters Deputy Tahsildar or Zonal Deputy Tahsildar, in whose jurisdiction the candidate claims to have permanent residence.

6.5.2. The candidates belonging to Thottia Naicker (including Rajakambalam, Gollavar, Sillavar, Thockalavar, Thozhuva Naicker, and Erragollar) included in the list of MBC / DC should produce the Community certificate, citing either father's / mother's name, issued by Head Quarters Deputy Tahsildar/ Zonal Deputy Tahsildar, in whose jurisdiction the candidate claims to have permanent residence.

6.5.3. Uploading of a community certificate citing name of the spouse, shall result in rejection of claim after due process.

6.5.4. The certificate obtained by the candidates in the form other than the one referred to in G.O. Ms. No.781, Revenue Department, dated 2nd May 1988 and solely based on the entries in SSLC or Transfer Certificate or other school / college records will not be accepted.

6.5.5. Candidates are warned that if the community recorded in the certificate produced by them from the competent authority is not included in the list of Backward Classes (Muslim), Backward Classes, Most Backward Classes / Denotified Communities, given in the Annexure to "Instructions to Applicants" [extracted from the Tamil Nadu Government Servants (Conditions of Service) Act, 2016], they will not be permitted to claim to belong to Most Backward Classes / Denotified Communities, Backward Classes (other than Muslim) or Backward Classes (Muslim), as the case may be. They will, in that case, be permitted to claim to belong to 'Others' category only.

6.5.6. Candidates belonging to Backward Classes, Most Backward Classes / Denotified Communities on conversion to religions other than Christianity / Islam, shall be treated as 'Others'.

6.5.7. Failure to upload the supporting documents, when called for shall result in the rejection of claim after due process.

7. Women:

7.1. Reservation of Appointments: A minimum of 30% of all vacancies shall be set apart for women candidates, irrespective of the fact of whether the rule of reservation of appointments applies to the posts or not. In respect of the posts to which the rule of reservation of appointments applies, 30% of vacancies shall be set apart for women candidates, following the reservation for each communal category as well as open category. Women / Transgender (women) candidates shall be entitled to compete for the said 30% of vacancies. They shall also be entitled to compete for the remaining 70% of vacancies along with male / Transgender / Transgender (men) candidates.

7.2. Supporting Documents: Gender claimed shall be verified against the Transfer Certificate / Community Certificate. Failure to upload the supporting documents at the time of submission of online application shall result in the rejection of candidature after due process.

8. Transgender:

8.1. Supporting Documents:

8.1.1. Transgender / Transgender (Male) / Transgender (Female) candidates should produce the Transgender ID card issued only by the Tamil Nadu Transgender Welfare Board.

8.1.2. Uploading of Transgender ID card, issued by any authority other than the Tamil Nadu Transgender Welfare Board shall result in rejection of candidature after due process.

8.1.3. Transgender or Transgender (Male) or Transgender (Female) claim made in the online application must correspond to what is stated in the Transgender ID card. Any discrepancy in this regard shall result in rejection of candidature after due process.

8.1.4. Gender claim unsupported by the requisite documents shall result in rejection of claim after due process.

8.2. Community:

8.2.1. Transgender candidates, who do not possess any community certificate may choose to be considered under 'Others' or under Most Backward Classes.

8.2.2. Transgender candidates who belong to Scheduled Caste / Scheduled Caste (Arunthathiyar) / Scheduled Tribe communities and possess community certificate as such, shall be considered as per their respective community.

8.2.3. Transgender candidates who belong to communities other than Scheduled Caste / Scheduled Caste (Arunthathiyar) / Scheduled Tribe and possess community certificate as such, are permitted to choose to be considered as belonging to their own community or as Most Backward Class, whichever is advantageous to them, at the time of One Time Registration itself. Once the individual opts to be considered as a particular community, it shall be crystallized and this option shall not be changed in the future.

8.2.4. Transgender candidates who do not possess a community certificate and have chosen to be considered under 'Most Backward Classes' or 'Others' and those in possession of a community certificate as Backward Classes / Backward Classes (Muslim) / Denotified Communities but have chosen to be considered under 'Most Backward Classes', need not upload a community certificate in support of their claim.

8.2.5. Transgender candidates, in possession of a community certificate and who have chosen to be considered under the communal reservation category as stated in the community certificate, must upload the same. Failure to upload such a certificate shall result in rejection of claim after due process.

8.2.6. All concessions permitted to Transgender candidates in the matter of choice of communal reservation category, shall be wholly dependent on the uploading of a Transgender ID card issued by the Tamil Nadu Transgender Welfare Board. Failure to upload the same or uploading of a Transgender ID card issued by other authorities, shall result in rejection of claim after due process.

Annexure III

Syllabus

Paper I

Tamil Eligibility Test, General Studies, Aptitude and Mental Ability

Part A - தமிழ் மொழி தகுதித் தேர்வு (பத்தாம் வகுப்பு தரம்)

Code: 503

அலகு I: இலக்கணம் (25 கேள்விகள்)

எழுத்து: பிரித்து எழுதுதல் - சேர்த்து எழுதுதல் - சந்திப்பிழை - குறில், நெடில் வேறுபாடு - லகர, ளகர, ழகர வேறுபாடு - னகர, ணகர வேறுபாடு - ரகர, றகர வேறுபாடு - இனவெழுத்துகள் அறிதல் - சுட்டு எழுத்துகள் - வினா எழுத்துகள் - ஒருமைப் பன்மை அறிதல்.

சொல்: வேர்ச்சொல் அறிதல் - வேர்ச்சொல்லில் இருந்து வினைமுற்று, வினையெச்சம், வினையாலணையும் பெயர், பெயரெச்சம் வகை அறிதல் - அயற்சொல் தமிழ்ச்சொல், எதிர்ச்சொல் வினைச்சொல் - எழுத்துப் பிழை, ஒற்றுப்பிழை அறிதல் - இரண்டு வினைச் சொற்களின் வேறுபாடு அறிதல்.

அலகு II: சொல்லகராதி (15 கேள்விகள்)

(i) எதிர்ச்சொல்லை எடுத்தெழுதுதல், ஒரெழுத்து ஒரு மொழி, உரிய பொருளைக் கண்டறிதல் - ஒருபொருள் தரும் பல சொற்கள், பொருந்தா சொல்லைக் கண்டறிதல், அகர வரிசைப்படி சொற்களைச் சீர்செய்தல்: ஒருபொருள் பன்மொழி - இருபொருள் குறிக்கும் சொற்கள் - பேச்சு வழக்கு, எழுத்து வழக்கு - சொல்லும் பொருளும் அறிதல் - ஒரு சொல்லிற்கு இணையான வேறு சொல் அறிதல்.

(ii) கோடிட்ட இடத்தில் சரியான சொல்லைத் தேர்ந்தெடுத்து எழுதுதல் - (எ.கா.) பள்ளிக்குச் சென்று கல்வி பயிலுதல் சிறப்பு (பயிலுதல், எழுதுதல்) - வானில் முகில் தோன்றினால் மழை பொழியும் (முகில், நட்சத்திரம்); பொருத்தமான பொருளைத் தெரிவு செய்தல் - (எ.கா.) ஊடகம் - தகவல் தொடர்புச் சாதனம் (செய்தி, தகவல் தொடர்புச் சாதனம்) - சமூகம் - மக்கள் குழு (மக்கள் குழு கூட்டம்); ஊர்ப் பெயர்களின் மருஉவை எழுதுக - (எ.கா) புதுச்சேரி - புதுவை, மன்னார்குடி - மன்னை, மயிலாப்பூர் - மயிலை; பிழை திருத்துக (எ.கா) ஒரு - ஓர் பேச்சு வழக்குச் சொற்களுக்கு இணையான தூய தமிழ்ச் சொற்களை இணைத்தல் - (எ.கா) வெத்தில - வெற்றிலை, நாக்காலி நாற்காலி.

(iii) பேச்சு வழக்குத் தொடர்களிலுள்ள பிழை திருத்தம் - (எ.கா.) நேத்து மழ் பேஞ்சது - நேற்று மழை பெய்தது; சொற்களை இணைத்துப் புதிய சொல் உருவாக்குதல்: மற்றும், அல்லது. ஆல், பிறகு வரை, இதுவுமல்ல, இருப்பினும், எனினும், இதனால்: அடைப்புக்குள் உள்ள சொல்லைத் தகுந்த இடத்தில் சேர்த்தல் - (எனவே, ஏனெனில், ஆகையால், அதுபோல, அதனால், வரை, பின்பு) - (எ.கா) நான் காட்டிற்குச் சென்றேன். அதனால் புலியைப் பார்த்தேன் - மாலைநேரம் முடியும் வரை விளையாடுவேன். தேர்வு முடிந்த பின்பு சுற்றுலா செல்லலாம்: பொருள் தரும் ஓர் எழுத்து - (எ.கா) ஆ-பசு, ஈ-கொடு, தை-மாதம், தீ-நெருப்பு; பல பொருள் தரும் ஒரு சொல்லைக் கூறுக - (எ.கா) கமலம், கஞ்சம், முளரி, பங்கயம் இச்சொற்கள் தாமரையைக் குறிக்கும்.

அலகு III: எழுதும் திறன் (15 கேள்விகள்)

(i) சொற்களை ஒழுங்குபடுத்திச் சொற்றொடர் அமைத்தல் - தொடர் வகைகள் - செய்வினை, செய்ப்பாட்டு வினை - தன்வினை, பிறவினை - ஒருமைப் பன்மை பிழையறிந்து சரியான தொடரறிதல்.

(ii) மரபுத் தமிழ்: திணை மரபு - உயர்திணை: அம்மா வந்தது - அம்மா வந்தாள்: அறிணை: மாடுகள் நனைந்தது - மாடுகள் நனைந்தன: பால் மரபு: ஆண்பால்: அவன் வந்தது - அவன் வந்தான்: பெண்பால்: அவள் வந்தது - அவள் வந்தாள்: பலர் பால்: அவர்கள் வந்தார்கள் - அவர்கள் வந்தனர்: ஒன்றன் பால்: அது வந்தது - அது வந்தது: பலவின் பால்: பறவைகள் பறந்தனர் - பறவைகள் பறந்தன: காலம்: நேற்று மழை பெய்யும் - நேற்று மழை பெய்தது: நேற்று வருவேன் - நேற்று வந்தேன்: இளமைப் பெயர்: பசு - கன்று: ஆடு - குட்டி: ஒலிமரபு: நாய் கத்தியது - நாய் குரைத்தது: வினைமரபு: கூடைமுடை, சோறு உண்: தொகை மரபு: மக்கள் கூட்டம் - ஆட்டு மந்தை, நிறுத்தல் குறியீடுகள்: கால்புள்ளி, அரைப்புள்ளி, முக்கால் புள்ளி, முற்றுப்புள்ளி, வியப்புக் குறி, வினாக்குறி அமையும் இடங்கள்.

அலகு IV: கலைச் சொற்கள் (10 கேள்விகள்)

பல்துறை சார்ந்த கலைச் சொற்களை அதாவது அறிவியல், கல்வி, மருத்துவம், மேலாண்மை, சட்டம், புவியியல், தொழில்நுட்பம், ஊடகம், தகவல் தொழில்நுட்பம் உள்ளிட்ட பல்துறை சார்ந்த கலைச் சொல்லுக்கு நேரான தமிழ்ச் சொற்களை அறிந்திருக்க வேண்டும். (உதாரணம்: search engine - தேடு பொறி, வலசை - Migration, ஒவ்வாமை - Allergy, மரபணு - Gene, கடல் மைல் - Nautical Mile).

அலகு V: வாசித்தல் - புரிந்து கொள்ளும் திறன் (15 கேள்விகள்)

கொடுக்கப்பட்ட பத்தியிலிருந்து கேட்கப்பட்ட வினாக்களுக்கு சரியான விடையைத் தேர்ந்தெடுத்தல் - செய்தித்தாள் - தலையங்கம் - முகப்புச் செய்திகள் - அரசு சார்ந்த செய்திகள் - கட்டுரைகள் - இவற்றை வாசித்தல் - புரிந்து கொள்ளும் திறன் - உவமைத் தொடரின் பொருளறிதல் - மரபுத் தொடரின் பொருளறிதல் - பழமொழிகள் பொருளறிதல் - ஆவண உள்ளடக்கங்களைப் புரிந்து கொள்ளும் திறன்.

அலகு VI: எளிய மொழி பெயர்ப்பு (5 கேள்விகள்)

ஆங்கிலம் மற்றும் பிறமொழிச் சொற்களுக்கு இணையான தமிழ்ச் சொற்கள் அறிதல் வேண்டும் - பயன்பாட்டில் உள்ள ஆங்கிலச் சொற்களை மொழிபெயர்த்தல் வேண்டும் (சான்று: pendrive, printer, computer, keyboard) - ஆவணங்களின் தலைப்பு - கோப்புகள் - கடிதங்கள் - மனுக்கள் - மொழிபெயர்ப்பு புரிந்து கொள்ளுதல்.

அலகு VII: இலக்கியம், தமிழ் அறிஞர்களும், தமிழ்த்தொண்டும் (15 கேள்விகள்)

திருக்குறள் தொடர்பான செய்திகள் (இருபது அதிகாரங்கள் மட்டும்) ஒழுக்கமுடைமை, பொறையுடைமை, ஊக்கமுடைமை, விருந்தோம்பல், அறன் வலியுறுத்தல், ஈகை, பெரியாரைத் துணைக்கோடல், வினை செயல்வகை, அவையஞ்சாமை, கண்ணோட்டம், அன்புடைமை, கல்வி, நடுநிலைமை, கூடா ஒழுக்கம், கல்லாமை, செங்கோன்மை, பண்புடைமை, நட்பாராய்தல், புறங்கூறாமை, அருளுடைமை - மேற்கோள்கள் - அறநூல் தொடர்பான செய்திகள் (நாலடியார், நான்மணிக்கடிகை, பழமொழி நானூறு, முதுமொழிக்காஞ்சி, திரிகடுகம், இன்னாநாற்பது, சிறுபஞ்சமூலம், ஏலாதி, அவ்வையார் பாடல்கள்) - தமிழின் தொன்மை, சிறப்பு, திராவிட மொழிகள் தொடர்பான செய்திகள் - உ.வே.சாமிநாத ஜயர், தெ.பொ.மீனாட்சி சுந்தரம், சி.இலக்குவனார் தமிழ்ப்பணி தொடர்பான செய்திகள் - தேவநேய பாவாணர், அகரமுதலி, பாவலரேறு பெருஞ்சித்திரனார், ஜி.யு போப், வீரமாமுனிவர் தமிழ்த் தொண்டு தொடர்பான செய்திகள் - தமிழ்ச் சான்றோர் பற்றிய செய்திகள்: பாவேந்தர், டி.கே.சிதம்பரனாதர், தவத்திரு குன்றக்குடி அடிகளார், கண்ணதாசன், காயிதே மில்லத், தாரா பாரதி, வேலுநாச்சியார், பட்டுக்கோட்டைக் கல்யாணசுந்தரம், முடியரசன், தமிழ் ஒளி உருத்திரங்கண்ணனார், கி.வா.ஜகந்தாதர், நாமக்கல் கவிஞர்.

**PART B: General Studies
(Degree Standard)**

UNIT I: General Science (5 Questions)

Scientific knowledge and scientific temper - Power of reasoning - Rote learning vs conceptual learning - Science as a tool to understand the past, present, and future; Nature of universe - General scientific laws – Mechanics - Properties of matter, force, motion, and energy - Everyday application of the basic principles of mechanics, electricity and magnetism, light, sound, heat, nuclear physics, laser, electronics, and communications; Elements and compounds, acids, bases, salts, petroleum products, fertilizers, pesticides; Main concepts of life science, classification of living organisms, evolution, genetics, physiology, nutrition, health and hygiene, human diseases; Environment and ecology; Latest inventions in science and technology; Current affairs.

UNIT II: Geography of India (5 Questions)

Location - Physical features - Monsoon, rainfall, weather and climate - Water resources - Rivers in India - Soil, Minerals and Natural Resources - Forest and Wildlife - Agricultural pattern; Transport – Communication; Social Geography – Population density and distribution - Racial, linguistic groups and major tribes; Natural calamity - Disaster management; Environmental pollution - Reasons and preventive measures - Climate change - Green energy; Geographical landmarks; Current affairs.

UNIT III: History, Culture of India, and Indian National Movement (10 Questions)

Indus Valley Civilization - Guptas, Delhi Sultans, Mughals, and Marathas - Age of Vijayanagaram and Bahmani Kingdoms - South Indian History; National Renaissance - Early uprising against British rule - Indian National Congress - Emergence of leaders – B.R.Ambedkar, Bhagat Singh, Bharathiar, V.O.Chidambaranar, Jawaharlal Nehru, Kamarajar, Mahatma Gandhi, Maulana Abul Kalam Azad, Thanthai Periyar, Rajaji, Subash Chandra Bose, Rabindranath Tagore, and others; Different modes of agitation: Growth of Satyagraha and Militant Movements; Communalism and Partition; Change and continuity in the socio-cultural history of India; Characteristics of Indian Culture, Unity in Diversity – Race, Language, Custom; India as a secular state, Social harmony; Prominent personalities in various spheres – Arts, Science, Literature and Philosophy.

UNIT IV: Indian Polity (15 Questions)

Constitution of India - Preamble to the Constitution - Salient features of the Constitution - Union, State and Union Territory - Citizenship, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy - Union Executive, Union Legislature - State Executive, State Legislature - Local Governments, Panchayat Raj - Spirit of federalism: Centre - State relationships - Election - Judiciary in India – Rule of Law - Corruption in public life – Anti-corruption measures - Lokpal and Lok Ayukta - Right to Information - Empowerment of Women - Consumer Protection Forums, Human Rights Charter; Political parties and political system in India; Current affairs.

UNIT V: Indian Economy and Development Administration in Tamil Nadu (20 Questions)

Nature of Indian Economy – Five-year plan models - an assessment - Planning Commission and Niti Aayog; Sources of revenue - Reserve Bank of India - Fiscal Policy and Monetary Policy - Finance Commission - Resource sharing between Union and State Governments - Goods and Services Tax; Structure of Indian Economy and Employment Generation, Land Reforms and Agriculture - Application of Science and Technology in Agriculture - Industrial growth - Rural welfare oriented programmes - Social problems - Population, Education, Health, Employment, Poverty; Human Development Indicators in Tamil Nadu and a comparative assessment across the Country – Impact of social reform movements in the socio-economic development of Tamil Nadu - Political parties, and welfare schemes for various sections of people - Rationale behind the reservation policy, and access to the social resources - Economic trends in Tamil Nadu - Role and impact of social welfare schemes in the socio-economic development of Tamil Nadu - Social Justice and social harmony as the cornerstones of socio-economic development; Education and health systems in Tamil Nadu; Geography of Tamil Nadu and its impact on economic growth; Achievements of Tamil Nadu in various fields; e-Governance in Tamil Nadu; Public awareness and General administration - Welfare oriented Government schemes and their utility, Problems in public delivery systems; Current socio-economic issues; Current affairs.

UNIT VI: History, Culture, Heritage, and Socio-Political Movements in Tamil Nadu (20 Questions)

History of Tamil Society, related archaeological discoveries, Tamil literature from Sangam age till contemporary times - Thirukkural - Significance as a secular literature - Relevance to everyday life, Impact of Thirukkural on humanity, Thirukkural and universal values - Relevance to Socio-politicoeconomic affairs, Philosophical content in Thirukkural; Role of Tamil Nadu in freedom struggle - Early agitations against British Rule - Role of women in freedom struggle; Evolution of 19th and 20th century socio-political movements in Tamil Nadu - Justice Party, Growth of Rationalism - Self Respect Movement, Dravidian Movement, and principles underlying both these movements; Contributions of Thanthai Periyar and Perarignar Anna.

PART C: Aptitude and Mental Ability (SSLC STANDARD)

UNIT I: Aptitude (15 Questions)

Simplification - Percentage - Highest Common Factor (HCF) - Lowest Common Multiple (LCM) - Ratio and Proportion - Simple interest - Compound interest - Area - Volume - Time and Work.

UNIT II: Reasoning (10 Questions)

Logical reasoning - Puzzles - Dice - Visual reasoning - Alpha numeric reasoning - Number series.

Paper II

1. Agriculture (Degree Standard)

Code: 491

Unit I: Importance of Agriculture (10 Questions)

Importance of Agriculture in Indian Economy and its sectoral relationship - Agricultural Development through five year plans in India and Tamil Nadu - Growth pattern of crops in India and Tamil Nadu in terms of area, production and productivity - Government Agricultural Policies – Agricultural development through NITI AAYOG – import and export – role of NSC, FCI and PDS - Sustainable Developmental Goals.

Unit II: Fundamentals of Crop Production (20 Questions)

Factors of Production - Agricultural seasons of India and Tamil Nadu - Cropping patterns in India and Tamil Nadu - package of practices of different crops – Agro-Climatic zones of India and Tamil Nadu and their features - Weather and Climate - Weather forecasting – Remote sensing and GIS application - Climate change and its impact – Minimal tillage practices – Stress mitigating technologies including microorganisms – Nanoparticles and their applications – Natural farming and Bio-inoculants – Organic certification and standards – Drone technology in Agriculture.

Unit III: Natural Resource Management (20 Questions)

Soil - Soil structure - Factors influencing soil structure - Physical and Chemical properties - Effect of nutrient availability and plant growth – Soil health - Problem soils and their management - Soil survey - its objectives and scope - Soil fertility and productivity – Soil testing – Chemistry of Macro and Micro Nutrient – Soil health - Integrated Nutrient Management - Dry farming - Rainfed agriculture - Conservation of soil and water - Watershed and waste land development. Land use pattern and planning - Size and distribution of holdings - types and systems of farming - Water resources development and management - Command area development - Ground water Development and Conjunctive use - Water use efficiency - Quality of irrigation water - Its effect in soil and crops - Management of poor quality water for crop growth.

Unit IV: Crop Management & Allied Agricultural Activities (24 Questions)

Cropping systems and integrated farming - Recycling of agricultural waste - Organic manures, green manures, bio fertilizers - Balanced usage - integrated nutrient management - Physiological disorders in crop plants and their management - Plant growth regulators – Regulation of flowering – Classification of stresses – Physiological adaptation of crop plants for abiotic stress - Irrigation management of different crops, Mushroom cultivation, bee keeping, silkworm rearing etc., Energy in Agricultural production - Sources - Solar, wind, animal, biomass and biogas - Mechanization in agriculture - Tractors & tillers - Agricultural implements and Machineries and their usage - livestock and poultry rearing.

Unit V: Crop Improvement (26 Questions)

Principles of breeding - Breeding methods in self, cross and vegetatively propagated crops - Modern tools in crop improvement – Heterosis breeding and Hybrid seed production technologies – Synthetic and composites – Breeding for biotic, abiotic and quality traits. Latest varieties of major crops in Tamil Nadu – Variety release procedures - Application of bio technology in Agriculture - Tissue culture & its significance - Transgenic Plants - Marker assisted selection – Markers - mapping population - speed breeding - Plant Genetic Resources: Collection conservation and exchange-Crop varietal protection-PPV& FR authority and its role.

Unit VI: Seed Science and Technology (20 Questions)

Seeds - Importance of quality seeds in Agriculture – Nucleus, Breeder, foundation, certified and labelled seeds – Characterisation of good quality seeds - Seed certification techniques and processing in Tamil Nadu - Seed testing – Seed testing laboratories-ISTA standards for seed testing - seed village concept Seed Act - Seed coating and priming technologies - Seed enhancement technologies – Varietal deterioration of crops – causes and maintenance – Post harvest handling of seeds.

Unit VII: Crop Protection Principles and Practices (24 Questions)

Importance of pest, disease, nematodes and weed management in agriculture – categories of pests, diseases, nematodes and weeds - pest and disease surveillance and weather forecasting on pest and disease incidence - Symptoms of damages, biology and control measures of pest, disease and nematodes of major crops in Tamil Nadu - Integrated pest, disease and nematode management in crop production - Pesticides and their use in IPM – mode of action - Pattern - plant protection equipments and their use - Plant quarantine - Storage pests, disease and nematodes and their management - Importance of biological control in pest, disease and nematode management - Weeds - Major weeds and their control – Pollinators and their safety – Banned and Next generation agro-chemicals.

Unit VIII: Farm Business and Finance Management (20 Questions)

Farm business management - Principles of farm business management – Types and systems of farms- Classical Production Functions - Cost concepts - Management of resources - Farm Planning and budgeting - Investment analysis – Risk and uncertainties in Agriculture - Agricultural credit system in India - Multi credit delivery system - Role of nationalized banks, NABARD and Regional Rural Banks - Lead Bank Scheme - Service area approach - Scale of finance-Credit Worthiness-3Rs,5Cs and 7Ps of credit-Crop Insurance - Kisan Credit Cards (KCC) - Agricultural Insurance Company.

Unit IX: Agricultural Marketing and Market Intelligence (20 Questions)

Marketing - Agricultural marketing - Market structure – Marketing Efficiency - Price Spread-Market Integration-Market Risk-Speculation and hedging - Market Institutions- Warehouses and rural godowns - Agmark-Cooperatives - Commodity Boards – Agri business management – Farmer Producer Organisations and Agri-business incubation - Principles of Management-Entrepreneurship - Development - Forms of Business organizations - Agricultural Price Policy - CACPMSP - FRP- Procurement Price-Policies for agricultural development - Economic liberalization - WTO and its impact on agricultural export - IPR – APEDA – International trading in agricultural commodities - Importance of Agriculture in Indian economy - Land size and distribution of holdings and land use pattern in Tamil Nadu - Agriculture under Five Year Plans (FYPs) - Food Security - Public Distribution Systems (PDS) - Buffer Stock.

Unit X: Agricultural Extension: Principles and Methods (16 Questions)

Extension methods for transfer of technology - AV aids-Communication models - Use of ICT in transfer of technology-Diffusion and adoption- Pre and post independent rural development initiatives: key features, strength and weakness of individual programmes - Programme planning and evaluation methods- Rural sociology - key features of Indian rural system-value system-social change- rural migration. Role of women in Agriculture – Social organisations and Non-Governmental organisations – Extensions / Agricultural Developmental programs by ICAR / Government –e-Agriculture and Digital Tools.

2. Agricultural, Mechanical, Automobile and Civil Engineering (Degree Standard)

Code: 562

Unit I: General Engineering (20 Questions)

Statics of Particles, Equilibrium of Rigid bodies, Properties of Surfaces and Solids, Centroid, Centre of Gravity, Dynamics of Particles, Friction in Machine Elements, Stress, Strain and Deformation of Solids, Theories of Failures, Design of Shafts and Couplings, Fluid statics, equations of continuity and momentum, Bernoulli's equation, Flow through pipes, head losses in pipes, bends, Pumps and its applications, Valves and Types, Iron Carbide Phase Diagram, ferrous and nonferrous alloys, Heat treatment of ferrous and non-ferrous metal, Engineering and commodity polymers, composites, nano-materials, Foundry Technology- Metal Forming Processes, Metal Joining processes, Manufacturing of Thermo Setting and Thermo Plastic Products, Inventory control - Economic Order Quantity (EOQ) - quantity discounts, ABC Analysis, Operations Research, Assignment Model, Critical Path Method (CPM) and Program Evaluation Review Technique (PERT), Queuing Models, Industrial Safety.

Unit II: Surveying and Hydrology (20 Questions)

Surveying – Instruments - Methods of surveying – Linear measurements - Computation of area – Triangulation, intersection, traversing, cross staff survey – Plane table survey – Earth work computation - Simpson's and trapezoidal rule - Levelling - Definition - Types of benchmarks - Different types of levels – Reduced level by rise and fall method and height of collimation method - Contouring – Profile surveying - Cross section survey - Use of Minor instruments - Theodolite survey - Total station - GPS survey. Hydrology – Measurement of rainfall, evaporation and infiltration – Estimation of runoff – Factors affecting runoff – Computation of volume of runoff and peak flow – Unit hydrograph - Occurrence and movement of ground water - ground water exploration techniques - hydraulics of wells, types of wells and their construction - Well drilling – Methods and machinery - Techniques for different formations - Well logging - Types of well screen - Design of well screens - Well development - Yield testing.

Unit III: Soil Erosion and Conservation (15 Questions)

Soil erosion – Types – Factors affecting erosion by water and wind - Stages of water erosion - Biological control measures and their suitability - Contour farming, strip cropping, mixed cropping, intercropping and mulching - Mechanical control measures and their suitability – Design and construction of contour bunds, graded bunds, terraces, contour stone walls, contour trenches, staggered trenches and diversion drain - Gully control structures - Drop spillway, chute spillway, pipe inlet spill way and check dams - Wind erosion – Types and control - Wind breaks and shelter belts - Dry farming techniques for improving crop production - Estimation of soil erosion - Universal Soil Loss Equation.

Unit IV: Watershed Development and Management (15 Questions)

Watershed – Concept, types and delineation - Land capability classification - Participatory Rural Appraisal Technique – Watershed development plan – Estimation of cost and benefits -Gully and ravine reclamation – In-situ & Ex-situ water harvesting, micro catchments – Ground water recharge - Artificial recharge techniques and methods - Farm pond and percolation pond – Selection of suitable soil and water conservation practices – Afforestation – Holistic planning - Watershed based rural development – Use of aerial photography and remote sensing in watershed management - Applications of Remote sensing and GIS in planning and development of watersheds including forest cover and water resources.

Unit V: Farm Irrigation, Structures and Drainage (30 Questions)

Irrigation - Sources – Soil- water- Plant relationship - Water requirement of crops – Measurement of irrigation water - Weirs and flumes - Methods of irrigation - Surface, Sprinkler, Rain gun and drip irrigation - Irrigation automation - Drip irrigation – Components and design - Wetting pattern - Filters and Fertigation tanks - Pump capacity - Operation and maintenance - Sprinkler irrigation - Components - Sprinkler performance - Hydraulic design of sprinkler systems - Duty and delta relationship – Irrigation scheduling - Irrigation efficiencies and their estimation - Pumps - Types, selection and installation - Design and construction of farm structures – Site selection – Quality – RCC - Foundation, basement and superstructure – Types of roofs – building plan and estimation, requirements of farm house, threshing floor, drying floor, poultry house, dairy farm, rat proof go down and farm roads - Design features earthen dams and gravity dams - Water conveyance structures – Earthen channels and lined channels – Advantages of lining – materials of lining – Design of channel cross section – Crossing control structures – Road crossing structures – Culvert, inverted siphon aqueduct – Their uses - Underground pipe line system – Components and their functions – Structures for plant environment – Green houses, poly houses and shade nets – Construction and utilization - Soilless culture. Drainage - Causes of water logging and salt problem - Methods of drainage - Design of surface, sub-surface and vertical drainage systems - Improvement and utilization of poor quality water - Reclamation of saline and alkali soils.

Unit VI: Farm Power (20 Questions)

Sources of Farm Power- Construction and working of Spark Ignition (SI) and Compression Ignition (CI) engines- Thermodynamic principles of SI and CI engine - Two stroke and Four stroke engines - Turbo charging – Fuel injection systems, Ignition, Lubrication and Cooling systems, Speed governors, Electrical systems of Internal Combustion engines - Different types of tractors, bull dozers and power tillers - power transmission systems, Types of Clutches and Gearboxes, Differential, Final drive system, Braking system – types, constructional details and operation, Steering system - – types, constructional

details and operation, Suspension system – types, constructional details, uses of hydraulic system in tractors, hitching system, three point linkage- tractor power outlets. Resistances to vehicle motion, vehicle performance characteristics, Operations using bull dozer, Types of wheels and tyres – Battery: types, constructional details and working principle. Tractor stability - mechanics of tractor implement combination, weight transfer - Ergonomic considerations in operation of tractors, Safety devices in tractors, Maintenance of tractors. Single phase induction motor - three phase power measurement methods- Power factor- Electrical pump sets - regulated DC power supply, DC machine, DC generator, DC motor, starter - torque and efficiency - Electronics in Agriculture - Semi -conductors, transistors, operational amplifiers – Digital electronics, counters, encoders, decoders, Digital to Analog and Analog to digital converter- Instrumentation - transducers - strain gauges, types and gauge factor - force measurement using strain gauges, Torque measurement, pressure measurement, flow measurement temperature measurement, thermocouples, speed measurement microprocessors, microcontrollers, PID controllers, PLC - Electric vehicles in Agriculture.

Unit VII: Farm Machinery (20 Questions)

Earth moving equipment - Back hoe with front end loader, Crawler excavator - Bull dozer - blades-shovels-soil digging machines-primary tillage implements-indigenous plough, Mould board plough, disc plough, chisel plough, sub soiler, methods of ploughing – secondary tillage implements-cultivators, harrows, rotary tillers, rotavator, land shaping machinery- laser leveller, ridger, bund former, raised bed former, puddler. Calculation of field capacity, field efficiency. Sowing and transplanting –seed drills, types - different types of metering mechanisms, planters, broadcasters and rice transplanters, pneumatic planters- intercultural implements - dryland weeders, wetland weeders, manual and power operated weeders - plant protection equipments – sprayers - types of sprayers - Drone sprayer - calibration of sprayer, types of nozzles, drift – harvesters - sickle, mower, cutter bar, reaper, binders, windrowers - threshers - principle of threshing, types of threshers, threshing drums, calculation of output capacity, combines, working principles, components of combine. Root crop harvesters, cotton harvesters, cotton strippers, sugarcane harvester, maize harvesters, vegetable and fruit harvesters, crop residue management machinery - cost estimation of farm machinery.

Unit VIII: Unit Operations in Food and Agricultural Processing (20 Questions)

Heat transfer principles – Conduction, convection and radiation - Types of heat exchangers - Unit operations – Evaporators - Types - Mechanical separation – Filtration – Sedimentation – Settling – Centrifugal separation – Cyclone separation - Size reduction – Mixing – Blending – emulsification - Food processing operations - Pasteurization – Sterilization – Canning - Retort processing - Extrusion processing of foods - Methods of drying of foods – Preservation of food by irradiation - Microwave and dielectric heating - Fats and oil processing – Extraction methods and equipment - Food packaging – Materials and characteristics – Suitability - Processing of milk and milk products, packaging of milk - Principles of refrigeration and applications in food industries – Cold storage of fruits and vegetables - Design aspects

Unit IX: Process Engineering of Agricultural and Horticultural crops (20 Questions)

Engineering properties of food materials – Moisture content – Methods of determination – Psychrometry - Drying – Thin layer and deep bed drying – Types of heat sources and types of dryers - Cleaning and grading – Principles – Separators – Efficiency – Performance index - Shelling and decortication – Seed processing and layout of seed processing units - Rice processing – Parboiling and dehusking of paddy – Machines used - Milling of corn, pulses and millets - Material handling equipments - Conveyors and elevators - Storage – Conditions for safe storage – Bag and bulk storage – Silo storage - Design aspects - Modified atmosphere storage – Storage structures - Equipment used for processing of horticultural crops – Preservation of fresh fruits and vegetables – Drying and dehydration – Processing of coffee, tea, rubber, cashew nut, coconut, oil palm, aromatic plants, flowers and spices.

Unit X: Renewable and Bioenergy (20 Questions)

Solar energy – Solar collectors – Air heaters - Solar dryers – Water heaters - Solar cold storage– Solar photovoltaic systems and applications- Solar PV pump, fencing - Wind energy - Suitable sites – Types of wind mills – Wind mill components – Applications – Performance of wind mills - Biomass resources

– Agro residues – Characteristics - Conversion technologies – Biochemical conversion – Biogas plant – Types and selection, construction, operation and maintenance - Slurry handling - Thermochemical conversion – Stoves – Types - Improved stoves – Pyrolysis – Charcoal production – Gasification – Briquetting – Alternate renewable energy systems - Hydro power, Geothermal, ocean and hydrogen energy- Energy storage systems- Energy Conservation- Cogeneration - Energy plantation and environmental impact – Global warming – Clean development mechanism (CDM) and role of afforestation - Biofuels – Biodiesel feedstock, production and by-product utilization – Ethanol – Production and utilization – Emission - Standards and control.

3. Chemistry (Degree Standard)

Code: 430

Unit I: Physical Chemistry (35 Questions)

(a) Chemical Thermodynamics: (25 Questions) Terminology – Systems and surroundings - First Law of thermodynamics - C_p and C_v relation - Hess's law of constant heat summation - Kirchoff's equation - extensive and intensive properties- second law of thermodynamics - entropy and entropy as a measure of probability - Free energy and Chemical equilibria - variation of free energy with temperature and pressure - Gibb's and Helmholtz equation – Heterogeneous equilibria and Le Chatlier principle.

(b) Solid State Chemistry: (10 Questions) Crystalline and amorphous solids - unit Cell - Miller Indices – symmetry elements in crystals (cubic system only)- Bragg's equation - radius ratio's and packing in crystals- determination of crystal structures by Bragg's method – structure of NaCl, Wurzite , TiO_2 and spinels.

Unit II: (30 Questions)

(c) Chemical Kinetics: (15 Questions) Rate laws - rate constant - order and molecularity of reactions - I, II, III, and zero order reactions – concept of Arrhenius theory - Collision theory and Transition state theory -catalysis.

(d) Electrochemistry: (15 Questions) Conductance in electrolytic solution, specific and molar conductance - Ostwald's dilution law - Kohlraush's law - Debye Huckel theory- Types of reversible electrodes - Nernst equation - reference electrode and standard hydrogen electrode - computation of cell e.m.f. -calculations of thermodynamic quantities of cell reactions (ΔG , ΔH , ΔS and K) Determination of pH and pK_a of acids by potentiometric methods.

Unit III: (12 Questions)

(e)Analytical chemistry and Instrumental methods:

Principle, instrumentation and applications of UV- Visible, IR, Raman, NMR, Mass, GCMS and Atomic Absorption spectroscopy.

Unit IV: (20 Questions)

Inorganic Chemistry

(f) Periodic classification: (14 Questions) Classification based on electronic configuration – periodic properties - atomic and ionic radii, ionisation potential, electron affinity and electronegativity - various scales - Trends along periods and groups.

(g)Chemical bond: (3 Questions) Lattice energy - VSEPR Theory and its applications - partial ionic character from electronegativity - Fajan's Rule.

(h) Compounds of Boron: (3 Questions) Electron deficient nature of boron compounds - preparation and properties of halides and nitrites of boron - diborane - Borazine, silicones and structures of silicates

Unit V: (20 Questions)

(i) Lanthanides and Actinides: (7 Questions) Position in the periodic table, occurrence, electronic configuration, oxidation state - lanthanide contraction - magnetic properties and complexation behaviour - comparison of lanthanides and actinides.

(j) Nuclear Chemistry: (13 Questions) Radio activity - detection and measurement – Half-life period - nuclear stability, - n/p ratio - isotopes, isobars and isotones -nuclear reactions - spallation - nuclear fission and fusion - stellar energy Uses of nuclear energy - nuclear power projects in India - Applications of radioactive isotopes in industries, medicine and agriculture.

Unit VI: (20 Questions)

(k)Co-ordination Chemistry: (10 Questions) Nomenclature – theories of co-ordination compounds- Werner, valence bond, crystal field theories - Effective atomic number – isomerism.

(l)Analytical Chemistry: (10 Questions) Principles of volumetric analysis - different types of titrations- Gravimetric analysis – Basic principles - Separation and purification techniques

Unit VII: (25 Questions)**Organic Chemistry:**

(m) Nature of Bonding: (18 Questions) Hybridisation (sp , sp^2 and sp^3) and Geometry of molecules - cleavage of bonds - homolytic and heterolytic fission of carbon – carbon bonds - Reaction intermediates - free radicals, carbocations and carbanions - their stability.

(n) Types of reactions: (7 Questions) Nucleophilic, electrophilic, free radicals, addition, elimination, substitution, oxidation and reduction reactions.

Unit VIII: (18 Questions)

(o) Electron displacement effects: (8 Questions) Inductive, inductometric, electromeric, mesomeric, resonance, hyper conjugation and steric effects.

(p)Stereochemistry: (10 Questions)

Optical isomerism and Geometrical isomerism - chirality - optical isomerism of lactic and tartaric acid - Racemisation – Resolution-asymmetric synthesis - Walden inversion - cis and trans isomerism of maleic and fumaric acids-R-S-Notations - conformational analysis of cyclohexane

Unit IX: (5 Questions)

(q) Carbohydrates: Classification, sources, preparation and reactions - Glucose, Fructose, Sucrose and lactose- structure of glucose and fructose.

(r) Amino acids – Classification - Zwitter ion - peptide linkage - structure of proteins - structure and functions of DNA and RNA

(s) Hormones and vitamins - Classifications, sources and functions

Unit X: (15 Questions)

(t)Pharmaceutical Chemistry: (10 Questions) Terminology-pharmacology, pharmacotherapies, toxicology, chemotherapy, classification and nomenclature of drugs, sources of drugs, Assay of drugs by biological, chemical and immunological methods, physiological effects of functional groups of drugs - Different types of drugs like analgesics, antibiotics, antiseptics, disinfectants, anaesthetics, **antacids**, **antimalarial** antidepressants, antipsychotic and **sedatives**.

(u) Nano Chemistry: (5 Questions)

Definition – types of nano materials – Nano drugs and their delivery- Applications of nano materials in medicine

4. Civil Engineering (Degree Standard)

Code: 398

Unit I: Building Materials and Construction Practices (20 Questions)

Properties and testing of engineering materials-brick, stones, M-sand, aggregates, cement, timber, recycled and modern materials-glass, plastic FRP, ceramic- concrete – properties and testing - mix design-admixtures, Self-compacting concrete steel construction practice-stone masonry, brick masonry, R.C.C. and block masonry – construction equipment - building bye-laws and development regulations practiced in Tamil Nadu - Provisions for fire safety, lighting and ventilation- Acoustics.

Unit II: Engineering Survey (15 Questions)

Survey - Chain- Compass - Plane table - levelling - Theodolite- computation of area and volume-L.S. and C.S. – Contour - Traversing – traverse adjustment- -Heights and Distances - Tacheometry and Triangulation - total station and GPS and Remote sensing techniques for surveying.

Unit III: Engineering Mechanics and Strength of Materials (20 Questions)

Forces- types-laws - centre of gravity-moment of inertia-friction-Stresses and strains -Thermal stress - elastic constants - Beams - Bending moment and shear force in beams - Theory of simple bending - deflection of beams - torsion - Combined stresses – stresses on inclined planes - Principal stresses and principal planes - Theories of Failure – Analysis of plane trusses.

Unit IV: Structural Analysis (20 Questions)

Indeterminate beams - Stiffness and flexibility methods of structural analysis - Slope deflection - Moment Distribution method – Arches and suspension cables - Theory of columns - moving loads and influence lines – Matrix method- Stability of retaining walls – plastic theory- Seismic analysis of high rise building

Unit V: Geotechnical Engineering (25 Questions)

Formation of soils - types of soils - classification of soils for engineering practice - Field identification of soils - Physical properties and testing of soils - Three phase diagram - permeability characteristics of soils - stress distribution in soils - Theory of consolidation, shear strength parameters of soils – stabilization of soil -Compaction of soils- Stability analysis of slope - Soil exploration - Soil sampling techniques – SPT -Borelog profile - shallow foundations - Terzaghi's bearing capacity theory - Pile foundation –pile load test- Group action of piles - settlement of foundations- Ground Improvement techniques.

Unit VI: Environmental Engineering and Pollution Control (15 Questions)

Sources of water - Water Demand -- Characteristics and analysis of water – hydraulics for conveyance and transmission - water borne diseases – Functional design of water treatment plant – desalination plant- water distribution system – pipe network analysis- characteristics and composition of sewage - Planning and design of sewerage system - sewer appurtenances - Pumping of sewage - sewage treatment and disposal - Design of storm water drain- plumbing system in high rise building - industrial waste treatment - solid waste management – Air and Noise pollution control – E-Waste management.

Unit VII: Design of Reinforced Concrete, Prestressed Concrete and Steel Structures (30 Questions)

Design of concrete members - limit state and working stress design concepts - design of slabs - one way, two way and flat slabs - Design of singly and doubly reinforced sections and flanged sections -design of columns and footings – pre- stressing - systems and methods- post tensioning slabs - Design of pre-stressed members for flexure.

Design of tension and compression members - Design of bolted and welded connections design of members of truss - designs of columns and bases - design of beams, plate girders and gantry girder- design of liquid storage structures –elevated and underground- design of retaining wall.

Unit VIII: Hydraulics and Water Resources Engineering (20 Questions)

Hydrostatics-applications of Bernoulli equation – losses in pipes - flow measurement in channels - open channel flow- types of pumps and characteristics - Applications of Momentum equation, Kinematics of flow. Water resources in Tamil Nadu - Water resource planning - Master plan for water management - flood control – Runoff estimation – hydrograph – flood routing - Soil plant water relationship - Water requirement for crops - Irrigation methods – Design of alluvial canal and design of headworks. Water logging and land reclamation - cross drainage works.

Unit IX: Urban and Transportation Engineering (20 Questions)

Urbanization trend and impact - Slum clearance and slum improvement programmes - Different modes of transport and their characteristics. Geometric design of highways. – Pavement materials and testing – alternate pavement materials- modified binders - Design and Construction of bituminous and concrete roads – pavement distress and evaluation - Maintenance of roads – Railways - Components of permanent way - Signalling, Interlocking and train control - drainage in roads and railways. Airport planning - Components of Airport - Site selection – Runways – Planning of terminal buildings Harbours & Ports - Layout of a harbour - Docks - Breakwaters.

Unit X: Project Management and Estimation (15 Questions)

Construction management - Construction planning - Scheduling and monitoring - Cost control, Quality control and inspection - Network analysis - CPM and PERT -methods of project management - Resources planning and resource management - Types of estimates - Preparation of technical specifications and tender documents – e-tender - Building valuation - law relating to contracts and arbitration.

5. Civil Engineering, Traditional Architecture and Sculpture (Degree Standard)

Code: 510

Unit I: Building Materials and Construction Practices (20 Questions)

Properties and testing of engineering materials-brick, stones, M-sand, aggregates, cement, timber, recycled and modern materials-glass, plastic FRP, ceramic- concrete – properties and testing - mix design- admixtures, Self-compacting concrete steel construction practice-stone masonry, brick masonry, R.C.C. and block masonry – construction equipment - building bye-laws and development regulations practiced in Tamil Nadu - Provisions for fire safety, lighting and ventilation- Acoustics.

Unit II: Engineering Survey and Estimation (20 Questions)

Survey - Chain - Compass - Plane table - levelling - Theodolite - computation of area and volume- L.S. and C.S. – Contour - Traversing – traverse adjustment - Heights and Distances - Tacheometry and Triangulation - total station and GPS and Remote sensing techniques for surveying - Types of estimates - Preparation of technical specifications and tender documents – e-tender - Building valuation - law relating to contracts and arbitration.

Unit III: Engineering Mechanics and Strength of Materials (20 Questions)

Forces - types-laws - centre of gravity - moment of inertia - friction - Stresses and strains -Thermal stress - elastic constants - Beams - Bending moment and shear force in beams - Theory of simple bending - deflection of beams - torsion - Combined stresses – stresses on inclined planes - Principal stresses and principal planes - Theories of Failure – Analysis of plane trusses.

Unit IV: Structural Analysis (20 Questions)

Indeterminate beams - Stiffness and flexibility methods of structural analysis - Slope deflection - Moment Distribution method – Arches and suspension cables - Theory of columns - moving loads and influence lines – Matrix method- Stability of retaining walls – plastic theory- Seismic analysis of high rise building

Unit V: Geotechnical and Highway Engineering (20 Questions)

Formation of soils - types of soils - classification of soils for engineering practice - Field identification of soils - Physical properties and testing of soils - Three phase diagram - permeability characteristics of soils - stress distribution in soils - Theory of consolidation, shear strength parameters of soils – stabilization of soil -Compaction of soils - Geometric design of highways – Pavement materials and testing – alternate pavement materials - modified binders - Design and Construction of bituminous and concrete roads – Pavement distress and evaluation – Maintenance of roads - Stability analysis of slope - Soil exploration - Soil sampling techniques – SPT - Borelog profile - shallow foundations - Terzhagi's bearing capacity theory - Pile foundation –pile load test- Group action of piles - settlement of foundations- Ground Improvement techniques.

Unit VI: Environmental Engineering and Pollution Control (20 Questions)

Sources of water - Water Demand - Characteristics and analysis of water – Hydrostatics-applications of Bernoulli equation – losses in pipes - flow measurement in channels - open channel flow- types of pumps and characteristics - hydraulics for conveyance and transmission - water borne diseases – Functional design of water treatment plant – desalination plant- water distribution system – pipe network analysis - characteristics and composition of sewage - Planning and design of sewerage system - sewer appurtenances - Pumping of sewage - sewage treatment and disposal - Design of storm water drain- plumbing system in high rise building - industrial waste treatment - solid waste management– Air and Noise pollution control – E-Waste management.

Unit VII: Design of Reinforced Concrete, Prestressed Concrete and Steel Structures (20 Questions)

Design of concrete members - limit state and working stress design concepts - design of slabs - one way, two way and flat slabs - Design of singly and doubly reinforced sections and flanged sections - design of columns and footings – pre- stressing - systems and methods- post tensioning slabs - Design of pre-stressed members for flexure.

Design of tension and compression members - Design of bolted and welded connections design of members of truss - designs of columns and bases - design of beams, plate girders and gantry girder- design of liquid storage structures –elevated and underground- design of retaining wall.

Unit VIII: Temple Architecture and Sculpture Features (20 Questions)

Aayathi – Padhivinyaasam – Soil Testing – Foundation – Measurements – Santara – AshtangaVimana – Height Determination of Saanthikam and Vimana, PrakaraLakshana, ParivaraLakshana, MandapaLakshana, GopuraLakshana – Traditional Architectural Treatises – Saadhisandhavikalpa Temples – Upapida, Adishtana, Pada, Prastara, Kandam, Sikhara, Stupi, Kumbhalatha, Viruthaspuditham, Koshtapanjara – Torana – Garbagriha – ArdhaMandapa –MukhaMandapa – PrakaraMandapa – VahanaMandapa – Dwajasthamba – Bali peeda – Temple car – Temple Tank – Measurements for Vimanas and Gopurams (1 to 13 tier)

Iconographic Measurements – Types of Images – Six Manas – Talamana– Height resolution for God images – Banga(anotomy) characteristics – Costumes and Jewellery – Coiffure – Mudras – Asanas – Weapons and Lingas, 32 Ganapathy's – 16 Subrahmanyas – 16 Sivamurtis – Saptamatrikas, Sakthi images – 7 Tandavas – 63 Nayanmars – AshtaDikpalakas – Sthanaka, Asana and Sayana forms of Vishnu according to the Dasavatara – Yoga, Bhoga, Heroic types, 12 Alvars – Features of Garuda and Anjaneya – Significance of Metal Images – Processional images – Iconometry of Bronze images – Karukattudal – Alloying techniques –casting techniques – Preservation and Conservation of Bronze images.

Origin and Evolution of ancient Sculptures and Architecture – Indus Valley architecture and sculptures – Seals – Pictography – Vedic architecture – Buddhist architecture and sculptures during the Maurya period – Sungas, Satavahanas – Structural temples and Sculptures of the Gupta period – Cave temples and Structural temples of the Chalukyas – Temples and Icons of the Rashtrakutas–Uniqueness of the Kalinga architecture and sculptures – History and Art of the Hoysalas.

Unit IX: Temple Maintenance (20 Questions)

Definition – Aim – Ethics – Ethics of preserving its antiquity – Aims and Purpose of alignment and reconstruction – Damages in stone architecture – repairing the cracks and its techniques – Basic methods of preserving the structures – Preservation and Conservation (Stone – Brick – Wood – Metal) – Restoration of the foundation dilapidated due to natural disaster – Repairing the damages due to moisture content on the walls – The Conservation methods of Hindu Religious and Charitable Endowments – Preservation from salt corrosion and removing the vegetation on the Temple structures.

Unit X: Agamas and Tamil Literatures Depicting the Temple Architecture (20 Questions)

Saiva agamas – Agamas and Religious Acharyas – Divisions of Agamas- Significance of the Agamas – Definition of Agama and SaivaSiddhanta – The planning and execution of Temples through Agamas – Temple architecture in Kamikagama – Vaadula agama, Architecture in Rudragama – Vaishnava agama – Temple architecture in Vaikanasa and Pancharatra – 10 incarnations of Lord Vishnu – Temple architecture and Iconography in MarichiSamhita, PaadmaSamhita, AtriSamhita, BrihatSamhita – Temple architecture in Suprahbedagama – Vimanarchanakalpa – Kumaratantra .

Temple architecture in Tamil Literatures

Kamba Ramayana – Nagarapadalam (song no. 7 – 13,19,23 – 30) Kalingattuparani – 4 Temples (song no, 1 – 11)

Nedunalvadai (line 72 – 130) Madurakanchi (line 351 – 356)

Pattinapalai (line 142 – 145, 261 – 264, 285 – 287)

Chintamani – Kantharuvathanthaiyirilambagam(song no. 590 – 595) Thanigaipuranam – Agathiyar Arul perumpadalam (song no. 64 – 79) Apparpasuram in Devaram

Periyapuranam – PoosalarNayanar

Paripadal

Silappadikaram – Kundrakkuravai, Vettuvavari, Arangetrakaadai

(Explanation by Adiyaarkkunallar)

6. Computer Science, Information Technology, Electrical, Electronics and Communication Engineering (Degree Standard)

Code: 554

Unit I: Programming In C, Python and Object Oriented Programming (20 Questions)

C Programming:

Data Types – Expressions – Input / Output Operations – Decision Making and Branching Statements – Looping Statements – Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String – string operations – String Arrays. Simple programs – sorting – searching – matrix operations – Function – Definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic - Pointers and arrays – structure data type – structure definition – Structure declaration – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives - File Handling

Python Programming:

Python Interpreter and Interactive Mode-Data types-Statements- Expressions-Boolean Values and Operators-Strings-Arrays of Numbers- Lists-Tuples-Dictionaries-Functions-File Reading and Writing

Object Oriented Programming:

C++ Programming features – Data Abstraction – Encapsulation – Class – Object – constructors – static members – constant members – member functions – pointers – references – Role of this pointer – Storage classes – function as arguments – String Handling – Copy Constructor – Polymorphism – compile time and run time polymorphisms – Function overloading – operators overloading – dynamic memory allocation – Nested classes – Inheritance – virtual functions. Abstract class – Exception handling – Standard libraries – Generic Programming – templates – class template – function template – STL - containers – iterators – function adaptors – allocators – Parameterizing the class – File handling concepts.

Unit II: Data Structures and Algorithms (20 Questions)

List ADT – array based implementation – linked list implementation – singly linked lists – circularly linked lists – doubly-linked lists – applications of lists – Polynomial Manipulation – All operation (Insertion, Deletion, Merge, Traversal) – Stack ADT – Evaluating arithmetic expressions – other applications – Queue ADT – circular queue implementation – Double ended Queues – Priority Queues – application of queues – Trees: Binary Tree - Binary Search Tree-Tree Traversals –Operations- AVL Tree-Splay Tree-Red Black Tree- Binary Heap- Skew Heap- Leftist Heap - Binomial Heap-Fibonacci Heap- Sorting algorithms: Insertion sort – Selection sort – Shell sort – Bubble sort – Quick sort – Merge sort – Radix sort – Heap Sort - Searching: Linear search – Binary Search - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing – Graph Algorithms: Minimum Spanning Tree – Shortest Path Algorithms - Graph Traversals -Directed Acyclic Graph- Topological Ordering-All Pair Shortest Path Algorithms- Floyd Warshall algorithm- Bellman Ford Algorithm-Network Flow Algorithms- Ford Fulkerson Algorithm-Amortized Analysis of Algorithms - Algorithm Analysis: Asymptotic Analysis-Solving Recurrence Equations-Algorithm Design Techniques- Greedy Algorithms-Dynamic Programming-Divide and Conquer.

Unit III: Digital Logic and Computer Architecture (20 Questions)

Boolean Algebra and Logic Gates – Combinational Logic – Sequential logic Functional Units of a Digital Computer - Arithmetic operations : Addition and Subtraction – Binary Multiplication – Binary Division – Floating Point Numbers – Addressing Modes - Instruction Set Architecture – RISC and CISC Architectures CPU Performance Metrics - Data path and Control – Hazards: Structural, Data and Control Hazards – Dynamic Scheduling – Speculation – ILP and Thread Level Parallelism – Memory Hierarchy – Cache Memories – Virtual Memory – Associative memories – Accessing I/O devices Interrupts - Direct Memory Access – Multicore Architectures – Open MP – MPI – Cache coherence policies – GPU architectures and programming.

Unit IV: Database Management Systems (20 Questions)

INTRODUCTION TO DBMS – File Systems Organization – Sequential, Pointer, Indexed, Direct – Purpose of Database System – Database System Terminologies – Database Characteristics – Data models – Types of data models – Components of DBMS – Relational Algebra. LOGICAL DATABASE DESIGN: Relational DBMS – Codd's Rule – Entity – Relationship model – Extended ER Normalization – Functional Dependencies, Anomaly – 1 NF to 5 NF – Domain Key Normal Form – Denormalization. SQL & QUERY OPTIMIZATION – SQL Standards – Data types – Database Objects – DDL – DML – DCL – TCL – Embedded SQL – Static vs Dynamic SQL – QUERY OPTIMIZATION: Query Processing and Optimization – Heuristics and Cost Estimates in Query Optimization – TRANSACTION PROCESSING AND CONCURRENCY CONTROL – Introduction – Properties of Transaction – Serializability – Concurrency Control – Locking Mechanisms – Two Phase Commit Protocol – Dead lock – TRENDS IN DATABASE TECHNOLOGY – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Object Oriented Database Management Systems- Object Oriented Relational Database management Systems

Unit V: Operating Systems and Cloud Technologies (20 Questions)

OPERATING SYSTEMS OVERVIEW – Computer System Overview – Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview – objectives and functions, Evolution of Operating System – Computer System Organization – Operating System Structure and Operations –System Calls, System Programs, OS Generation and System Boot – PROCESS MANAGEMENT – Processes – Process Concepts, Process Scheduling, Operations on Processes, Interprocess Communication; Threads – Overview, Multicore Programming, Multithreading Models; Windows 7 – Thread and SMP Management. Process Synchronization – Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling and Deadlocks – STORAGE MANAGEMENT – Main Memory – Contiguous Memory – Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory – Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples – I/O SYSTEMS – Mass Storage Structure – Overview, Disk Scheduling and Management; File System Storage – File Concepts,

Directory and Disk Structure, Sharing and Protection; File System Implementation – File System Structure, Directory Structure, Allocation Methods, Free space Management; I/O Systems.

Cloud Technologies: Cloud Characteristics-Cloud Service and Deployment Models-Virtualization-Virtual Machines-Server, Network and Storage Virtualization-Hypervisor-Cloud Security Requirements-Threats: Malicious Attacks-Events and Alerts- Security Information and Event Management - Hadoop –Map Reduce Technique.

Unit VI: Software Engineering (20 Questions)

Software Process and Project Management:

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models - Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis – Risk Management – Introduction to Agility - Agile Process - Extreme Programming - XP Process - REQUIREMENTS ANALYSIS AND SPECIFICATION – Software Requirement: Functional and Non – functional, User requirements, System requirement, Software Requirements - Document – Requirement Engineering Process : feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management – Classical analysis: Structured system Analysis, Petri Nets – Data Dictionary - SOFTWARE DESIGN –Design process design Concepts – Design Model – Design Heuristic –Architectural Design – Architectural styles, architectural Design, Architectural mapping using dataflow – User Interface Design: Interface Analysis, Interface design – Component level Design: Designing Class based components, Traditional Components –TESTING AND IMPLEMENTATION –Software testing fundamental – Internal and external views of Testing – white box testing – basis path testing - control structure testing – black box testing – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques : Coding practices – Refactoring –PROJECT MANAGEMENT –Cost Estimation – FP Based, LOC Based, Make /Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking – Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics - DEVOPS Essentials - Build Model Using MAVEN - Building DEVOPS using Azure.

Unit VII: Web Technology (20 Questions)

SCRIPTING LANGUAGES –Web page designing using HTML, Scripting basics – Client side and server side scripting. Java Script – Object, names, literals, operators and expressions – statements and features – events – windows –documents – frames –date types –built-in functions – Browser object model – Verifying forms – HTML5 – CSS3 – HTML 5 canvas – Web site creation using tools – Event Handling- PHP Scripting - JAVA PROGRAMMING – Features of java – Data types, variables and arrays – Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input / Output – files – Utility Classes – Strong Handling – JDBC – JDBC Overview –JDBC implementation – Connection class – Statements – Catching Database Results, handling database Queries. Networking –Inet Address class – URL class – TCP sockets – UDP sockets, Java Beans –RMI – APPLETs – Java applets – Life Cycle of an Applet – Adding Images to an Applet – Adding Sound to an Applet – Passing Parameters to an Applet - Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, Using Cookies, Session Tracking - MVC Architecture – Nodejs - Events – Listeners – Timers - Callbacks – Handling Data - Implementing HTTP Service in Nodejs – NOSQL – MongoDB – Frameworks – SPRING – MERN – MEAN – Flutter

Unit VIII: Computer Networks and Security (20 Questions)

NETWORKING FUNDAMENTALS & LINK LAYER –Building a network- requirements – Layering and protocols – Internet Architecture – Network software – Performance; Link layer Services – Framing – Error Detection – Flow control – MEDIA ACCESS & INTERNETWORKING – Media access control-Ethernet (802.3) – wireless LANs -802.11 – Bluetooth – switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)- ROUTING – Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM) - TRANSPORT LAYER – Overview of Transport layer – UDP- Reliable byte stream (TCP) – Connection management –

Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements – APPLICATION LAYER - Traditional applications - Electronic Mail (SMTP, POP3, IMAP, MIME) HTTP – Web Services - DNS – SNMP – Mobile Computing – Mobile Computing Vs. wireless Networking – Mobile Computing Application – Characteristics of Mobile Computing – Structure of Mobile Computing Applications. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes – MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER – Overview of Mobile IP- Features of Mobile IP- Key Mechanism in Mobile IP – Route Optimization. Overview of TCP/ IP – Architecture of TCP/ IP – adaptation of TCP Window – Improvement in TCP Performance – MOBILE AD-HOC NETWORKS – Ad- Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular AdHoc networks (VANET)- MANET Vs VANET – Security – Cryptographic Algorithms – Caesar Cipher – Hill Cipher – Vignere cipher – LFSR Sequences – Number Theory – GCD – Chinese Remainder Theorem – Fermat’s Theorem and Euler’s Theorem – Symmetric key Cryptography – DES – AES Algorithms – Public key algorithms – RSA – Diffie-Hellman Algorithm – ElGamal System – Elliptic Key Cryptography – Digital Signatures – Digital Certificates – Hashing – MD5 – SHA1 – Key Management – Kerberos – PKI – IP Security – Email Security – SSL – SET – OS Security – Database Security.

Unit IX: Microprocessor and Embedded Systems (20 Questions)

8085 Architecture, Instruction set, addressing modes, Assembly language programming, Interrupts, timing diagrams, memory and I/O interfacing; 8086 Architecture, Instruction set, addressing modes, minimum and maximum mode configuration, assembler directives, assembly language programming, interrupts; 8051 Architecture, Special Function Registers (SFRs) instruction set, addressing modes, assembly language programming, I/O ports, Timers/counters, interrupts and serial communication.

Embedded System design process, Embedded processors – ARM Processor – Architecture, ARM Instruction sets – Addressing Modes – Pipelining – Embedded C Programming – Looping Structures – Register Allocation – Function calls – Pointer aliasing – Structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues. Profiling and cycle counting – instruction scheduling – optimized primitives. Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Exception and interrupt handling – Performance issues. Meeting real time constraints – Multi-state systems and function sequences – Embedded software development tools – Emulators and debuggers.

Unit X: Electrical, Electronics and its Applications (20 Questions)

Ohm’s Law - Kirchhoff’s Laws – Solution of DC circuits with Independent sources only (Steady state), AC Fundamentals: Waveforms, Average value, RMS Value, Impedance, Instantaneous Power, Real Power, Reactive Power and Apparent Power, Power Factor – Steady State Analysis of RL, RC and RLC Circuits- three phase circuits.

Magnetic Circuits– DC Machines: Construction, Working Principle, Types and Applications of DC Generator and Motor, EMF and Torque equation. AC Machines: Construction, Working and Applications of Transformer, Three phase Alternator, Synchronous motor, Single and Three Phase Induction Motor, stepper motor, servo motor and BLDC motor.

Operation and Characteristics of electronic devices: PN Junction Diodes, Zener Diode, BJT, JFET, IGBT and MOSFET– Voltage regulators - Operational Amplifiers - 555 timer IC based astable and monostable multivibrator.

Solenoids, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, Hall Effect, photo sensors, Strain gauge, LVDT, piezo electric crystals, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

Moving Coil and Moving Iron Instruments, Power Measurement, Energy Meter, Instrument Transformers - CT and PT, Multimeter- DSO- Data Acquisition Systems – A/D and D/A Converters – Data Transmission Systems – smart meters.

Single and Three Phase AC to DC Converters – uncontrolled and controlled rectifiers– Switched Mode Power Supplies – buck, boost and buck-boost converter topologies – switching losses – Inverters – Single

and Three Phase Inverters – Voltage control – Pulse Width Modulation techniques – harmonic elimination techniques – Uninterrupted Power Supplies- Batteries – types and characteristics.

7. Computer Science, Computer Application and Information Technology (PG Degree Standard)

Code: 556

Unit I: Computer Fundamentals, Programming in C, Python and Object Oriented Programming (40 Questions)

Computer Basics and Practices:

Parts of a Computer – Input/Output Devices, Processors, Network Devices, Tools for Basic Software Applications – Word Processors – Presentation tools – Spread sheet – Email tools – Database Processor tools (SQL, MySQL, PostgreSQL, Oracle Database, MS-Access) – Online Meeting Platform.

C Programming:

Introduction to IT – Problem Solving – C Programming – Constants – Variables – Data Types – Expressions – Input/Output Operations – Decision Making and Branching Statements – Looping Statements – Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String – string operations – String Arrays. Simple programs – sorting – searching – matrix operations – Function – Definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic - Pointers and arrays – Function Pointer - Structure data type – structure definition – Structure declaration – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives - File Handling

Python Programming:

Python Interpreter and Interactive Mode-Data types-Statements- Expressions-Boolean Values and Operators-Strings-Arrays of Numbers- Lists-Tuples-Dictionaries-Functions-File Reading and Writing.

Object Oriented Programming:

C++ Programming features – Data Abstraction – Encapsulation – Class – Object – constructors – static members – constant members – member functions – pointers – references – Role of this pointer – Storage classes – function as arguments – String Handling – Copy Constructor – Polymorphism – compile time and run time polymorphisms – Function overloading – operators overloading – dynamic memory allocation – Nested classes – Inheritance – virtual functions. Abstract class – Exception handling – Standard libraries – Generic Programming – templates – class template – function template – Standard Template Library (STL) - containers – iterators – function adaptors – allocators – Parameterizing the class – File handling concepts.

Unit II: Data Structures and Algorithms (20 Questions)

Linear Data Structures – Abstract Data Types (ADTs) – List ADT – array based implementation – linked list implementation – singly linked lists – circularly linked lists – doubly-linked lists – applications of lists – Polynomial Manipulation – All operation (Insertion, Deletion, Merge, Traversal) – Stack ADT – Evaluating arithmetic expressions – other applications – Queue ADT – circular queue implementation – Double ended Queues – Priority Queues - application of queues – Trees: Binary Tree - Binary Search Tree-Tree Traversals –Operations- AVL Tree-Splay Tree-Red Black Tree- Binary Heap- Skew Heap- Leftist Heap - Binomial Heap-Fibonacci Heap- Sorting algorithms: Insertion sort – Selection sort – Shell sort – Bubble sort – Quick sort – Merge sort – Radix sort – Heap Sort - Searching: Linear search – Binary Search - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing – Graph Algorithms: Minimum Spanning Tree – Shortest Path Algorithms - Graph Traversals -Directed Acyclic Graph- Topological Ordering-All Pair Shortest Path Algorithms- Floyd Warshall algorithm- Bellman Ford Algorithm-Network Flow Algorithms- Ford Fulkerson Algorithm-Amortized Analysis of Algorithms - Algorithm Analysis: Asymptotic Analysis-Solving Recurrence Equations-Algorithm Design Techniques-Greedy Algorithms-Dynamic Programming-Divide and Conquer- Back Tracking-Complexity classes – P, NP, NP Complete, NP Hard.

Unit III: Digital Principles, Computer Organization and IoT Concepts (20 Questions)

BOOLEAN ALGEBRA AND LOGIC GATES – Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebra and Theorems – Boolean Functions – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods – Logic Gates – NAND and NOR Implementations. COMBINATIONAL LOGIC – Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and Demultiplexers – Introduction to Hardware Description Language (HDL) – HDL Models of combinational circuits – SEQUENTIAL LOGIC - Sequential Circuits – Latches and Flips Flops – Analysis and Design Procedures – State Reduction and State Assignment – Shift Registers – Counters – HDL for Sequential Logic Circuits – Computer Organization – Components of a computer system – Technology – Performance – Power Wall - Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes – ALU – Addition and subtraction – Multiplication – Division – Floating Point operations – PROCESSOR AND CONTROL UNIT – Basic MIPS Implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions – MEMORY AND I/O SYSTEMS – Memory hierarchy – Memory technologies – Cache basics – Measuring and improving cache performance – Virtual memory, Translation Lookaside Buffer (TLBs) – Input/ output system, programmed I/O, Direct Memory Access (DMA) and interrupts, I/O processors. 8-Bit Embedded Processor - IoT Devices – Arduino - Sensors and Actuators - IoT Communication Models and API - Communication Protocols - Programming and Interfacing - Connecting to the Cloud.

Unit IV: Probability and Queueing Theory (5 Questions)

RANDOM VARIABLES – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – TWO – DIMENSIONAL RANDOM VARIABLES – Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – RANDOM PROCESSES – Classification – Stationary process – Markov process – Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions – QUEUEING MODELS – Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little's formula – Queues with finite waiting rooms – Queues with impatient customers: Balking and renegeing.

Unit V: Database Management Systems (20 Questions)

INTRODUCTION TO DBMS – File Systems Organization – Sequential, Pointer, Indexed, Direct – Purpose of Database System – Database System Terminologies – Database Characteristics – Data models – Types of data models – Components of DBMS – Relational Algebra. LOGICAL DATABASE DESIGN: Relational DBMS – Codd's Rule – Entity – Relationship model – Extended ER Normalization – Functional Dependencies, Anomaly – 1 NF to 5 NF – Domain Key Normal Form – Denormalization. SQL & QUERY OPTIMIZATION – SQL Standards – Data types – Database Objects – DDL – DML – DCL – TCL – Embedded SQL – Static vs Dynamic SQL – QUERY OPTIMIZATION: Query Processing and Optimization – Heuristics and Cost Estimates in Query Optimization – TRANSACTION PROCESSING AND CONCURRENCY CONTROL – Introduction – Properties of Transaction – Serializability – Concurrency Control – Locking Mechanisms – Two Phase Commit Protocol – Dead lock – TRENDS IN DATABASE TECHNOLOGY – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Object Oriented Database Management Systems-Object Oriented Relational Database management Systems

Introduction to Distributed Databases – Multidimensional and Parallel databases – Spatial and Multimedia databases – Mobile and web databases – Data Warehouse – Mining – Data marts - NoSQL Database-CAP Theorem - Document Based Systems-Key Value Stores-Column Based Database-Graph Database-Database Security-Access Control Mechanisms-Big Data-Big Data Analytics-Big Data Tools

Unit VI: Operating Systems and Cloud Technologies (20 Questions)

OPERATING SYSTEMS OVERVIEW – Computer System Overview – Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview – objectives and functions, Evolution of Operating System – Computer System Organization – Operating System Structure and Operations – System Calls, System Programs, OS Generation and System Boot – PROCESS MANAGEMENT – Processes – Process Concepts, Process Scheduling, Operations on Processes, Interprocess Communication; Threads – Overview, Multicore Programming, Multithreading Models; Thread and SMP Management. Process Synchronization – Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling and Deadlocks – STORAGE MANAGEMENT – Main Memory – Contiguous Memory – Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory – Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples – I/O SYSTEMS – Mass Storage Structure – Overview, Disk Scheduling and Management; File System Storage – File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation – File System Structure, Directory Structure, Allocation Methods, Free space Management; I/O Systems.

Distributed Systems: Distributed System Models-Distributed Communications-Global States-Causal Ordering of Events-Distributed Mutual Exclusion Algorithms-Deadlock detection in Distributed Systems-Consensus and Agreement Algorithms

Cloud Technologies: Cloud Characteristics-Cloud Service and Deployment Models-Virtualization-Virtual Machines-Server, Network and Storage Virtualization-Hypervisor-Cloud Security Requirements-Threats: Malicious Attacks-Events and Alerts- Security Information and Event Management - Hadoop –Map Reduce Technique.

Unit VII: Software Engineering (15 Questions)

SOFTWARE PROCESS AND PROJECT MANAGEMENT: Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models - Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis – Risk Management – Introduction to Agility - Agile Process - Extreme Programming - XP Process - REQUIREMENTS ANALYSIS AND SPECIFICATION – Software Requirement: Functional and Non – functional, User requirements, System requirement, Software Requirements - Document – Requirement Engineering Process : feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management – Classical analysis: Structured system Analysis, Petri Nets – Data Dictionary - SOFTWARE DESIGN –Design process design Concepts – Design Model – Design Heuristic – Architectural Design – Architectural styles, architectural Design, Architectural mapping using dataflow – User Interface Design: Interface Analysis, Interface design – Component level Design: Designing Class based components, Traditional Components –TESTING AND IMPLEMENTATION –Software testing fundamental – Internal and external views of Testing – white box testing – basis path testing – control structure testing – black box testing – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques : Coding practices – Refactoring –PROJECT MANAGEMENT –Cost Estimation – FP Based, LOC Based, Make /Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking – Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics - DEVOPS Essentials - Build Model Using MAVEN - Building DEVOPS using Azure.

Unit VIII: Web Technology and Mobile Application Development (20 Questions)

SCRIPTING LANGUAGES – Web page designing using HTML, Scripting basics – Client side and server side scripting. Java Script – Object, names, literals, operators and expressions – statements and features – events – windows –documents – frames – date types – built-in functions – Browser object model – Verifying forms – HTML5 – CSS3 – HTML 5 canvas – Web site creation using tools – Event Handling- PHP Scripting - JAVA PROGRAMMING – Features of java – Data types, variables and arrays – Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input / Output – files – Utility Classes – String Handling – JDBC – JDBC Overview –JDBC implementation – Connection class – Statements – Catching Database Results, handling database Queries. Networking – Inet Address class – URL class – TCP sockets – UDP sockets, Java

Beans –RMI. Introducing AWT and Swing: Working with Windows Graphics and Text. Using Controls, Layout Managers and Menus – Event Handling. Servlet – life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, Using Cookies, Session Tracking - MVC Architecture – Nodejs - Events – Listeners – Timers - Callbacks – Handling Data - Implementing HTTP Service in Nodejs – NOSQL – MongoDB – Frameworks – SPRING – MERN – MEAN – Flutter.

Mobile Application Development – J2ME Architecture – Configurations and Profiles – Mobile Information Device Profile (MIDP) – MIDlets.

Unit IX: Computer Networks and Security (20 Questions)

NETWORKING FUNDAMENTALS & LINK LAYER – Building a network- requirements – Layering and protocols – Internet Architecture – Network software – Performance; Link layer Services – Framing – Error Detection – Flow control – MEDIA ACCESS & INTERNETWORKING – Media access control- Ethernet (802.3) – wireless LANs - 802.11 – Bluetooth – switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)- ROUTING – Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM) - TRANSPORT LAYER – Overview of Transport layer – UDP- Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements – APPLICATION LAYER - Traditional applications - Electronic Mail (SMTP, POP3, IMAP, MIME) HTTP –Web Services - DNS –SNMP – Mobile Computing – Mobile Computing Vs. wireless Networking – Mobile Computing Application – Characteristics of Mobile Computing – Structure of Mobile Computing Applications. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes –MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER – Overview of Mobile IP- Features of Mobile IP- Key Mechanism in Mobile IP – Route Optimization. Overview of TCP/ IP – Architecture of TCP/ IP – adaptation of TCP Window – Improvement in TCP Performance – MOBILE AD-HOC NETWORKS – Ad- Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular AdHoc networks (VANET)- MANET Vs VANET – Security – Cryptographic Algorithms – Caesar Cipher – Hill Cipher – Vignere cipher – LFSR Sequences – Number Theory –GCD –Chinese Remainder Theorem – Fermat’s Theorem and Euler’s Theorem – Symmetric key Cryptography – DES – AES Algorithms – Public key algorithms – RSA – Diffe –Hellman Algorithm – ElGamal System – Elliptic Key Cryptography – Digital Signatures – Digital Certificates – Hashing – MD5 – SHA1 – Key Management – Kerberos –PKI –IP Security – Email Security – SSL – SET –OS Security – Database Security.

Unit X: Artificial Intelligence, Machine Learning and Data Science (20 Questions)

Artificial Intelligence: Problem Solving Agents-Search Algorithms- Uninformed Search strategies - Heuristics Search Strategies-Local Search and Optimization Problems-Adversarial Search – Constraint Satisfaction Problem (CSP)-Logics-Propositional Logic-First Order Logic- Reasoning: Probabilistic Reasoning

Machine Learning: Types of Learning-Linear Regression Models and Types - Logistic Regression-Bayesian Linear Regression - Gradient Descent- Linear Classification Models - Discriminant Functions - Probabilistic Discriminative Models-Probabilistic Generative Models- SVM - Decision Tree - Naïve Bayes-Bayesian Modelling - Ensembling-Bagging and Boosting – Stacking - Random Forest - Clustering-Gaussian Mixture Models - Expectation Maximization Algorithm - K Means - Probabilistic Graphical Models – HMM - Bayesian Inference - Neural Network - Multi Layer Perceptron - Feed forward Neural Networks - Back Propagation - Regularization

Data Science: Types of Data and Variables - Describing Data - Describing Relationships – Statistical Testing-Python Libraries for Data Wrangling – NumPY – Pandas – SciPy – Scikit-learn - Data Visualization – Matplotlib – Seaborn – Keras - Tensor Flow.

8. Criminology, Forensic Science, Psychology and Philosophy (Degree Standard)

Code.571

Unit I: Sociology and Psychology of Crime (20 Questions)

Anomie – Merton and Durkheim, Culture Conflict, Sub-culture theories. Theory of Imitation – Gabriel Tarde, Differential Association Theory, Drift and Neutralisation Theory, Translation Criminology, on-set and Influence of Drugs and Alcohol on children behavior. Vagrant and Truant children – Legal controls. Victimless crimes: Alcoholism, Drug Addiction, Beggary, Commercial Sex, Suicide, Delinquency. Anti-social Behavior.

Unit II: Family centered & Community Influences - Crimes against children and women under Indian Law (20 Questions)

Dowry, domestic violence, child abuse – Physical, Social, Sexual, Emotional and Neglect. Interreligion and Inter-caste tensions and conflicts. Honour killing, Hate crimes and Blasphemy. Fundamental Rights under constitution of India. Rights of person in custody. The protection of Human Rights Act, Protection of Children from Sexual Offences Act (POCSO). The Immoral Trafficking Prevention Act, 1956 (Amended 2006) – Child Marriage Act.

Unit III: Women and Juvenile Institutions with relevant legislations and International Guidelines (20 Questions)

Women Institutions: Vigilance Home, Protective Home children in conflict with law; children and vulnerability. Juvenile Justice Board, Child Welfare Committee, Observation Homes, Juvenile Justice (Care and Protection of children) Act, 2015. Juvenile Homes, Special Homes, Fit institutions, Juvenile Aftercare Services, Juvenile Police Unit, Probation of Offenders Act and Parole. 3-R's Rehabilitation of punishment, Reformation and Reintegration. United Nations Standard Minimum Rules for Juvenile Justice (Beijing Rules) and United Nations (Riyadh) Guidelines. Convention of the Rights of the Children, Prevention of Delinquency.

Unit IV: Crime Prevention and Victim Assistance (20 Questions)

Crime prevention; Primary, Secondary and Tertiary. Neighborhood involvement, Situational crime prevention, crime prevention through Environmental Design and Defensible space. United Nation Declaration of Basic principles of Justice for victims of Crime and Abuse of power, 1985. Impact of victimization – Physical, financial and psychological resilience, post – traumatic stress, growth, anger and aggression management, Repeat victimization, routine activities theory, life style exposure. Restitution and Restorative Justice.

Unit V: Forensic Science and Toxicology (20 Questions)

Forensic Science – Definition – Physical evidences – their classification and significance – Locard's Principle of Exchange Toxicology – classification and mode of action of poisons – narcotic drugs – alcoholic beverages – Isolation and Identification of poisons, drugs and alcohol. Drugs: Pharmacological actions, therapeutic uses and screening tests of the following drugs opium alkaloids-morphine, heroin, antibiotics synthetic analgesics phenothiazines, meprobamate, diazepam pethidine, methadone barbiturates stimulants tranquilizers amphetamines, imipramines hallucinogens cannabinoids, LSD hypnosis and sedatives antipyretics, analgesic, antiseptics and disinfectants - Alcohol manufacture of ethyl alcohol and liquors constituents of liquors estimation of alcohol contents in liquors denaturation, denaturants, industrial alcohol and power alcohol.

Definition of poisons - Mode of action of poisons - Extraction and purification of poisons in toxicological analysis - Volatile poisons – metallic poisons - non-volatile organic poisons - water soluble compounds - protein precipitation methods. Estimation of the following poisons Carbon monoxide, cyanide, formaldehyde, methanol, chloral, chloroform, phenols, cresols, phosphorus and amphetamines Signs and symptoms of H₂SO₄, HNO₃, CO₂, H₂ S poisoning. Analytical methods for the estimation of ethyl alcohol. Metallic poison-signs, symptoms of arsenic, mercury, lead and copper - Reinch test - Marsch Berzelius and Gutzeit tests volumetric, colorimetric and instrumental methods of analysis of the above metals. Pesticides & Insecticides Definition - general properties poisonous nature - detection & isolation.

Unit VI: Forensic Biology (20 Questions)

Examination of biological fluids - blood, semen and saliva stains – forensic characterization of the above stains – stain patterns of blood - Examination of fibres, hair, bones, teeth and skull – Fundamentals of DNA Typing. Forensic Anthropology - Anthropometry and its uses - Biochemical and Molecular Techniques: Blood and its composition – WBC, RBC and Platelets. Blood clotting, Blood grouping - Antigens and Immunoglobins – Classes and functions. Collection and Preservation of Biological fluids [Blood, Semen and Saliva] - Isolation of DNA from blood sample, and DNA Typing - Ethnobotany – Ethno Medicinal Plant, Narcotic Plant

Unit VII: Introduction to Psychology (20 Questions)

Psychology – Branches - Biological Bases of Behaviour – Brain, Nervous System – Heredity – Environment – Developmental Stages – Childhood - Adolescence – Adulthood – Attention – Kinds of Attention – Perception – Illusion – Consciousness – Sleeping – Consciousness altering drugs – Memory – Memory Models - Types of memory – Forgetting – Thinking – Intelligence – Theories of Intelligence - Emotional Intelligence – Intelligent Quotient (IQ) - Creativity – Theories of Creativity – Motivation – Drives – Classification of Motivation - Motives – Affiliation – Aggression – Emotion – Biological Basis – Theories of Emotions.

Unit VIII: Health, Social and Wellbeing Psychology (20 Questions)

Health Psychology – Behavioural and Psychological correlates of illness – Stress and coping – Managing Stress – Personality – Types of Personality – Projective Techniques – Adjustment – Models of Adjustment - Mental Disorders – Abnormality – Diagnosis – Diagnostic and Statistical Manual of Mental Disorders (DSM) – International Classification of Diseases (ICD) – Anxiety Disorder – Mood Disorder – Dissociative and Somatoform disorders – Schizophrenia, Psychotherapies – Mental Hygiene - Yoga and Meditation – Social Behaviour – Prejudice – Social Influence – Prosocial Behaviour – Group – Group Behaviour – Inter group relation.

Unit IX: Indian Philosophy (20 Questions)

Heterodox: Carvaka – Epistemology, Metaphysics and Ethics; Jainism – Bondage and liberation, Triratna and Panchamaha Vratas, Sects of Jainism – Svetambara and Digambara; Buddhism – Four noble truths, Eight fold path, Sects of Buddhism – Hinayana and Mahayana. Orthodox: Nyaya – Theory of knowledge; Vaisheshika – Theory of Atomism; Samkhya – Theory of Evolution, Theory of Causation; Yoga – Astanga Yoga; Purva Mimamsa – Theory of Knowledge; Vedanta – Advaita – Maya, Brahman & concept of liberation; Visistadvaita – world, God and liberation; Dvaita – Doctrine of Panchabedha.

Unit X: Logic and Ethics (20 Questions)

a) Logic: Nature and classification of Terms and Propositions, Laws of Thought, Square of Opposition, Obversion & Conversion – Rules of Categorical Syllogism with fallacies; Mixed Syllogism – Hypothetical, Disjunctive and Dilemma. Difference between Deduction and Induction, Problems of Induction Stages of Scientific Induction, Characteristics of Hypothesis, Observation and Experiment.

b) Ethics: Rta – Karma; Purusharthas; Varnashrama Dharma; Ethics of Buddhism, Jainism and Bhagavad Gita. Hedonism, Utilitarianism of Bentham and J.S. Mill, Intuitionism of Butler, Kant's Categorical Imperative, Bradley's – My Station and its Duties.

9. Electrical and Electronics Engineering (Degree Standard)

Code: 400

Unit I: Electrical Circuits (25 Questions)

Circuit elements – Kirchoff's Laws – Mesh and Nodal Analysis – Network Theorems and Applications for DC and AC circuits: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem – Sinusoidal Steady State Analysis of RL-RC-RLC Circuits - Resonant Circuits – Natural and Forced Response – Transient Response of RL-RC-RLC Circuits – Two – port networks – Three Phase Circuits – Star - delta transformation – real and reactive power – power factor

Unit II: Electric and Magnetic Fields (20 Questions)

Coulomb's Law – Electric Field Intensity – Electric Flux Density - Gauss's Law – Divergence – Electric Field and Potential due to Point, Line, Plane and Spherical Charge Distributions – Effect of Dielectric Medium – Capacitance of Simple Configurations – Magnetic Circuits – Magneto motive force – Reluctance - Faraday's laws - Lenz's law – Biot - Savart's law - Ampere's law - Fleming's Left and Right Hand Rule – Lorentz force – Inductance – Self and Mutual Inductance – Dot Convention – Coupled Circuits

Unit III: Measurements and Instrumentation (20 Questions)

Units and Standards – Static and Dynamic Characteristics – Types of Errors – Error Analysis – Measurement of Current, Voltage, Power, Power – factor and Energy – Indicating instruments – Measurement of Resistance, Inductance, Capacitance and Frequency – Bridge Measurements – Instrument Transformers – Electronic Measuring Instruments – Multi meters – True RMS meter – Spectrum Analyzer – Power Quality Analyser – Recording Instruments - X-Y Recorder –Magnetic Recorders – Digital Data Recorder – Oscilloscopes – DSO – LED and LCD Display – Transducers and their applications to the Measurement of Non –Electrical Quantities like Temperature, Pressure, Flow-rate, Displacement, Acceleration, Noise level – Data Acquisition Systems – A/D and D/A Converters –Data Transmission Systems – PLC – smart meters

Unit IV: Control Systems (15 Questions)

Mathematical Modelling of Physical Systems – Transfer Function - Block Diagrams and Signal Flow Graphs and their Reduction using Mason's Rule –Time Domain and Frequency Domain Analysis of Linear Time Invariant (LTI) System – Errors for Different Type of Inputs and Stability Criteria for Feedback Systems –Stability Analysis Using Routh – Hurwitz Array – Nyquist Plot and Bode Plot – Root Locus–Gain and Phase Margin – Basic Concepts of Compensator Design –PI, PD and PID Controllers – State Variable formulation – state transition matrix –Eigen values and Eigen vectors – free and forced responses of Time Invariant systems –controllability and observability.

Unit V: Electrical Machines (25 Questions)

D.C. Machines – Construction, Excitation methods – Armature Reaction and Commutation – Characteristics and Performance Analysis – Generators and Motors – Starting, Speed Control and braking – Testing – Losses and Efficiency. Transformers – Types – Construction and Operation – Testing – Equivalent Circuits – Losses and Efficiency – All day efficiency – Regulation – Parallel Operation –Three Phase Transformers – Auto-transformer. Induction Machines – Construction, Principle of operation – Rotating Magnetic Field – Performance, Torque – Speed Characteristics, No-load and Blocked Rotor tests, Equivalent Circuit –Starting, Speed Control and braking – Single-Phase Induction Motors –Linear Induction Motors – Hysteresis Motors – Reluctance Motors. Synchronous Machines –Construction – Operating characteristics and Performance analysis –Efficiency and Voltage regulation – Parallel operation – V and inverted V curves of synchronous motors – Power factor improvement – permanent magnet synchronous motor –Permanent magnet brushless dc motor – stepper motor

Unit VI: Power Systems (30 Questions)

Single Line Diagram of Power System – Per Unit Quantities –Power Generation Types - Hydro, Thermal and Nuclear Stations – Pumped storage plants –Co generation – Economic and operating factors – Modelling and performance characteristics of Power transmission lines and Cables - HVDC transmission –Mechanical Design of Transmission Lines - Sag – Insulators - ZBus and YBus formulation – Load flow studies – Shunt and Series Compensation –Symmetrical and Unsymmetrical Faults Analysis – Transient and Steady – State Stability of Power Systems – Equal Area Criterion – Voltage and Frequency Control – Power System Transients – Power System Protection – Circuit Breakers – Relays classification of protection schemes - overcurrent, distance, differential and carrier – Equipment protection - transformer, generator, motor, busbars and transmission line – AC and DC Distribution – deregulation –energy conservation and energy auditing

Unit VII: Analog and Digital Electronics (15 Questions)

Semiconductor Devices – PN junctions – Transistors – FET – Zener, Photo diodes and their applications – Rectifier circuits – Voltage regulators – Multipliers. Biasing circuits – Small signal amplifiers – Frequency

response – Multi stage amplifiers –Coupling methods – Large signal amplifiers – Push-pull amplifiers – Feedback amplifiers – Oscillators – Operational amplifiers and its applications – Precision rectifiers – Multi vibrators – Voltage Controlled Oscillator -Timer.Digitallogicgatefamilies(DTL,TTL,ECL,MOS,CMOS)– Logicgates-Simplification of Logic Functions – Design of Combinational circuits – Sequential logic circuits –latch – Flipflops – Counters – Registers – multiplexers and demultiplexers –Schmitt triggers – Memories (ROM,PLA and FPGA).

Unit VIII: Power Electronics and Drives (15 Questions)

Principle of Operation and Static and dynamic behavior of Power Semi conductor devices – Power Diode, DIAC, SCR, TRIAC, GTO, MOSFET and IGBT – Single and Three Phase AC to DC Converters – uncontrolled and controlled rectifiers –performance parameters – Single and Three Phase AC to AC converters – Switched Mode Power Supplies – buck, boost and buck-boost converter topologies – switching losses – Inverters – Single and Three Phase Inverters – Voltage control –Pulse Width Modulation techniques – harmonic elimination techniques –Uninterrupted Power Supplies – Electrical drives – motor load dynamics – load torque characteristics – Speed Control of DCD rives – Converter/Chopper fed dc motor drives – Speed control of AC drives – induction motor drives – stator voltage control and V/f control- synchronous motor drives - V/f control, self control, margin angle control and power factor control

Unit IX: Digital Processors and Communication (10 Questions)

Architecture of 8085, 8086 and 8051 – Instruction Sets – Assembly Language Programming – Interfacing for memory and I/O: 8255 Programmable Peripheral Interface – 8253 Programmable Timer Interface – 8279 Programmable Keyboard and Display Interface – 8257 Direct Memory Access Interface – Embedded processors (ARM and PIC basics only). Classification of Signals and systems –Properties of Discrete Fourier Transforms - FFT Computation – FIR Filters–IIR Filters: Butterworth Filters – Chebyshev Filters. Digital Communication Systems: Pulse Code Modulation and Demodulation –Adaptive Delta Modulation – Frequency Division and Time Division Multiplexing –Data Communication Network Topologies -7-layer OSI Protocol - IoT concepts

Unit X: Renewable Energy Sources and Storage Devices (25 Questions)

Renewable Energy – Sources and Features – Solar Radiation Spectrum – Radiation Measurement – Solar Photovoltaic Cell – principle of operation – types – MPPT – Microhydel – Operating principle – Wind Energy – components –wind power turbine types – MPPT – Site Selection – Types of Wind Generators – smart grid –Electric vehicles - V2G and G2V – Fuel Cells – Batteries – types and characteristics – Super Capacitors.

10. Environmental and Chemical Engineering (PG Degree Standard)

Code: 393

Unit I: Environmental Policy, Environmental Legislations and Environmental Impact Assessment (25 Questions)

National Environment Policy - International Conventions and Obligations, International treaties of Environment-Water (P&C) Act, 1974 as amended - Air (P&C) Act, 1981 as amended - Environmental Protection Act, 1986 with amendments and Rules and Notifications made under Environmental (Protection) Act, 1986 for the management of hazardous waste, solid waste, e-waste, bio-medical waste, plastic waste, C & D wastes, battery waste etc., EIA - Notification, Methodology, models, Environmental Monitoring and Management Plan, Public consultations as per EIA Notification.

Unit II: Environmental Chemistry and Environmental Microbiology (15 Questions)

Chemical mass balance – Emission calculations – Green Chemistry principles –Aquatic Chemistry - Atmospheric Chemistry and Soil chemistry – Representative sample collection techniques- Field and lab analysis - Wet and Instrumentation Methods - Chemical speciation, Classification and Characteristics of microorganisms - Microorganisms in wastewater and air - Applications of microorganisms in wastewater treatment and soil remediation.

Unit III: Principles & Design of Physico-Chemical treatment of Wastewater (20 Questions)

Water Quality criteria and indices - Wastewater characteristics - Unit operations - Principles and design of screens, grit chamber, skimming tanks - Flow equalisation and neutralisation - Aeration and gas transfer mechanisms – Sedimentation -Types of settling – analysis and Design of Sedimentation tanks - Process and design of filtration systems - Adsorption, ion exchange, electro-coagulation, Electrodialysis, reverse osmosis – RO reject Management - Disinfection.

Unit IV: Principles and Design of Biological Treatment of Waste water (25 Questions)

Types of Reactors - Mass Balance Analysis - Reaction and Reaction rates - Suspended growth process - Role of microorganism - Growth kinetics, oxidation, modelling, mCRT, F/M Ratio, Bio kinetic coefficients - Design of activated sludge process, Plug flow Reactor, Aerated lagoon - Oxygen Requirement, transfer of oxygen, Equipments- Secondary clarifier, Sludge Volume Index, Sludge production, Operation and maintenance, Attached growth process - Trickling filter - process, substrate removal, classification, design, NRC, Rankine's and Eccenfelder equation - Rotating Biological contactors - UASB - Sludge digestion - sludge management – Advanced Biological Treatment – SBR, MBR, ANSBR.

Unit V: Air and Noise pollution Control (15 Questions)

Sources and Effects – Classification - Photochemical reactions, Atmospheric Stability - Lapse Rates, Inversions, Plume Behaviour -Pollutant Dispersion, Emission Standards and Air Quality Standards, Air Quality Index, Methods of Pollutant Sampling and Measurement, Continuous emission and Air Quality monitoring. Control Methods for Particulate Emissions, Black carbon and Gaseous Pollutants; Indoor Air Pollution, Automobile Pollution-Emission Norms and Control Techniques, Source apportionment studies, Noise Pollution – Source – Effects – Standards - Measurement and Control Measures - Industrial Noise Measurement and control.

Unit VI: Solid and Hazardous Waste Management (25 Questions)

Sources, generation rate, classification and characteristics - source segregation and storage - methods of collection - transportation - route optimisation – treatment –Incineration, Pyrolysis, Composting, MBT and Landfilling, Bioremediation ,Bioaccumulations - disposal – Coprocess - Centralised and de-centralised processing - Landfill design and operation - Dumpsite rehabilitation, Management of hazardous waste, biomedical waste, plastic waste, construction and demolition wastes and E waste - Resource recovery, recycle, reuse and product development from waste.

Unit VII: Statistical Approach and Modelling of Environmental Systems (15 Questions)

Principles of Environmental modelling, Statistical approach, model building, environmental models, Data Sampling – Distributions – Inference - Estimation – Hypothesis Testing, Calibration, Validation, and Sensitivity Analysis. Types of air quality models-dispersion and emission models, chemical and ecological models, Pollutant and nutrient dynamics. Operational control of wastewater treatment processes, microbial dynamics calculations, Surface and ground water Modeling.

Unit VIII: Industrial Pollution Prevention and Cleaner Production Technologies (25 Questions)

Industrial Manufacturing process description, Wastewater Characteristics, Source reduction, Treatment and disposal, key issues emerging contamination and pollution control measures for highly polluting industries such as Paper and Pulp, Sugar, Distillery, Chemical plants - Metal finishing, Iron and Steel, fertilizer, Meat packing, Poultry plant - Automobile - Thermal power plants, Cement Plants, Textile dyeing, Tanneries, Pharmaceutical, pesticides, petroleum refinery and petrochemicals - Integrated Waste Management for zero discharge, Cleaner production process including process modification, raw material substitution - Recycle and reuse of waste.

Unit IX: Environmental Safety and Risk Assessment (15 Questions)

Health and Safety systems in work places. Hierarchy of control measures for occupational health risks. Accident, causes, mechanical and electrical hazards and preventive steps. Role of personal protective equipment and the selection criteria. Significance of human factors in the establishment emergency preparedness. Qualitative and quantitative risk assessment- Hazard identification and control, Hazard assessment, Overall risk contours for different failure scenarios – disaster management plan –

Safety measures design in process operations. Ergonomics effects on humans. Inspections and audits, safety policies, EHS issues.

Unit X: Sustainable Development, Environmental Management and Economics and Global, Regional and Local Environmental Issues (20 Questions)

Sustainable Development Principles - International Conventions and treaties-Sustainable Development Goals and Indicators, Environmental Management Systems – ISO 14001, 19000 - Environmental Auditing – Ecolabelling- Life cycle Assessment-Design for Environment, Economics of pollution prevention - Cost Benefit Analysis - Circular economy - Economic instruments for environmental protection - Pollutant tax and emission trading - Natural resource economics, green building concepts.

11. Environmental Science, Biology and Chemistry (PG Degree Standard)

Code: 557

Unit I: Introduction to Environment (30 Questions)

Environment: Components – Segments – Atmosphere: Troposphere – Stratosphere – Mesosphere – Thermosphere – Lithosphere: Crust – Mantle – Core – Hydrosphere: Fresh water and saline water - Biosphere – Ecology: Autecology – Synecology – Ecosystem: Structure and Function – Energy Flow – Food Chain – Food web – Ecological pyramids – Biogeochemical cycles (C,N, P, S and water) - Ecological successions: Primary and Secondary succession – Ecological interactions: Symbiosis - Commensalism – Mutualism - Proto-cooperation – Amensalism – Predation – Parasitism – Natural resources: Classification-renewable and non-renewable - Status and challenges. Water resources: Types – Availability – Issues - Conflicts over water. Soil and mineral resources - Mineral exploitation and Environmental impacts; Forest resources. Energy resources: Conventional and Non-conventional energy - Sustainable development: Sustainable Development Goals (SDGs)

Unit II: Environmental Pollution and Management (30 Questions)

Pollution – Pollutant – Contamination – Contaminant - Point and non-point sources. Air pollution: Sources - Primary and secondary pollutants - Criteria pollutants – VOCs – PAN - PAHs - POPs - Acid rain – Smog – Oxidizing - Reducing. Air Pollution dispersion models: Looping – Coning – Lofting – Trapping - Indoor air pollution –Effects. Control Measures: Scrubbers – Wet – Dry – Venturi – Filter – Bag filters – Dehumidifier-Electrostatic precipitators (ESP) – Flue Gas Desulfurization (FGD). Cyclonic separators – Catalytic converter. Noise pollution: Sources – Effects – Control measures. Water pollution: Sources – Effects – Eutrophication – Biomagnification – Bioaccumulation – Control Measure – Waste water treatments – Primary – Secondary –Tertiary – Common Effluent Treatment Plant (CETP) – Sewage Treatment Plant (STP) – Constructed Wetlands. Soil pollution: Sources – Effects – Control measure – Bioremediation – Microbial remediation – Phytoremediation - Heavy Metal Pollution – Hg - Cr – As – Se – Cd - Pb - Sources – Effects - Thermal and Radioactive pollution - Municipal solid waste - Hazardous waste – Biomedical waste – Effects - Control measures – Incineration – Pyrolysis - Gasification – Composting – Ecotoxicology: Toxicant – Toxicity – Acute – Subacute – Chronic - Dose descriptor – LD50 – LC50 – NOAEL- Dose response relationship- Fate of Chemical in environment: Insecticides Fungicides – Herbicides – Fertilizers – PCB - Dioxins. Land degradation- deforestation- desertification – urbanization- Ozone layer depletion – Greenhouse Gases and Climate change – Meteorological indicators - Remote Sensing and GIS for environmental Management – National river conservation plan – Carbon sequestration and carbon credits.

Unit III: Environmental Legislation, Policies and Standards (25 Questions)

Introduction to environmental laws - Constitutional provisions- Article 48A, Article 51A (g) – Article 21- Major Indian Environmental Legislations: Water Act - Air Act - Environment Protection Act – Environmental Protection Rules - Noise Pollution Rules – Biodiversity Act - Plastic and Solid waste management Rules – National Green Tribunal Act – Bio Medical Waste Management Rules – The E- Waste Management Rules – Hazardous and Other Wastes(Management and Transboundary Movement) Rules- Environmental Impact Assessment Notification – Coastal Regulation Zone Notification. Central Pollution Control Board (CPCB) - Environmental standards – Drinking water standards (IS 10500:2012)- Discharge of Industrial Effluents into inland – Public sewers – Irrigation – Marine – Standards for sewage treatment plants –

Designated best use water quality criteria. National Ambient Air Quality standards – Noise standards - National Green Tribunal – Environmental Impact Assessment: Screening- Scoping- Public consultation – Methodologies – Environmental management plan- ISO 14000 series – Life cycle assessment – Occupational health and safety: Preventive measures – Health screening measures.

Unit IV: Instrumentation and It's Applications (30 Questions)

Basic Principles, Instrumentation and applications of Ultraviolet-visible (UV-vis.) spectroscopy; Beer-Lambert's law, solution preparation and small molecules analysis and Flow Injection analyzer - Fourier Transformer Infrared spectroscopy (FT-IR): sample preparation - functional group analysis, Flame spectrometry, Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma - Mass Spectrometry (ICP-MS), Inductively Coupled Plasma Emission spectroscopy (ICP-OES), Fluorimetry – Chemiluminescence's Detector system, X-ray fluorescence spectroscopy (XFS), Microscopy techniques: (fundamentals only) Optical microscopy, Scanning Electron Microscopy (SEM). Transmission Electron Microscopy (TEM).

Chromatographic Techniques: Basic Principles, Instrumentation and applications of chromatography – Paper chromatography, Thin layer chromatography (TLC), High-performance Liquid chromatography (HPLC) and Gas chromatography (GC), Gas-Chromatography with Mass Spectrometry (GC-MS).

Electrochemical Techniques: Basic Principles, Instrumentation and application of conductometry, potentiometry – Ion selective meter – Voltammetry – Turbidimetry and nephelometry, Elemental analyzer, TOC analyzer, Portable Gas analysis, ambient air quality H₂S, CO₂, SO₂, NO₂, NH₃, O₃, HC Particulate analysis, Stack monitoring, Volatile organic Carbon (VOC).

Unit V: Analytical chemistry (30 Questions)

Titrimetric Analysis: Classification of reaction in titrimetric analysis – Standard Solutions – Normality, Molarity and Molality - concentration units – Primary and Secondary standard – neutralization indicators – self indicators and external indicators- acid base titrations – precipitation titrations – redox titrations.

Principles of gravimetric analysis – choice of precipitants and condition of precipitation, specific and selective precipitants – Dimethyl glyoxime (DMG), cupferron, phenolphthalein, salicylaldehyde, ethylene diamine – Co-precipitation and post precipitation.

Sampling techniques and procedure for solids, effluent, water and air - Physical evaluation of water; color, odour and turbidity. Chemical examination of water; alkalinity, Total Dissolved Solids (TDS), turbidity and total hardness. Determination of carbonates, bicarbonates, sulphates, chlorides, nitrates, phosphate, fluorides – sodium, potassium, SAR, iron, manganese, cadmium, chromium, lead, mercury and arsenic – oil and grease. Biological evaluation of water; dissolved oxygen, biological oxygen demand, chemical oxygen demand - organic pollutant and microbiological analysis.

Unit VI: Environmental Biology (10 Questions)

Physiology: Water relations of plants, Ion Transport, photosynthesis, Photolysis of water, Carbon fixation in C₃-C₄ cycles, Biological Nitrogen fixation, Stress physiology (Biotic and Abiotic), Photochemical reactions, Oxidative Phosphorylation. Biodiversity - Biodiversity and its distribution; Levels and types; Hotspots; Biodiversity loss - Threats to biodiversity - In-situ and ex-situ conservation approaches - Biosphere reserves – MAB program - Pollution indicator organisms and adaptive mechanisms in invertebrates, fishes, amphibians, reptiles and birds. Biophysics: Laws of Thermodynamics, Energy transduction in biological systems. Migration of fishes, birds and mammals. Endangered and extinct species - current status – IUCN Red list category.

Unit VII: Biochemistry Aspects of Pollution (10 Questions)

Introduction to Pollution and Biochemistry: Disruption of Biochemical Pathways by Pollutants. Carcinogens and Environmental Pollution: Definition and Types of Carcinogens, Mechanisms of Carcinogenesis - Oxidative Stress, Common Environmental Carcinogens. Biochemical Markers for Carcinogenesis: Asbestos Toxicity - Heavy metal toxicity: Lead, Cadmium, Mercury, Arsenic and their Biochemical Effects - Mechanisms of Toxicity: Free Radicals, Oxidative Stress, Antioxidants. Role of Blood Tests in Detecting Pollutant Exposure: Effect of pollutants on human health. Pathways for Detoxification: Phase I and Phase II Detoxification.

Unit VIII: Environmental Microbiology (15 Questions)

Environmentally transmitted Microbial Pathogens (*Mycobacterium tuberculosis*, *Streptococcus pyogenes*, *Salmonella typhi*, *E.coli*, *Vibrio cholerae*, *Clostridium botulinum*), Viruses (Enteric and Respiratory), Indicator Microorganisms – Total and Faecal Coliforms, Faecal Streptococci. Biofouling and Biofilms; Microbial toxicants (Tetanus toxin, Botulinum toxin), Aflatoxin, Waste water treatment (Aerobic and anaerobic) – Waste conversion using microorganisms - Biofertilizer – Important plant diseases caused by Bacteria, Mycoplasma, Virus, Fungi and Nematodes – Biocontrol agents – Integrated pest management. Microbial Biotechnology – Fermentation technology – fermentation as a biochemical process – Bioconversion: Production of Alcoholic beverages, Antibiotics, Amino acids, Vitamins and Organic Acids – Single Cell Protein production (SCP).

Unit IX: Marine Environment (15 Questions)

Fundamentals of marine biology: Physical chemical properties of seawater-Chemical Properties-Vertical stratification- horizontal stratification of marine ecosystem-Marine Ecosystems: coastal; pelagic; and estuaries; deep sea; coral reefs; mangroves; sea grass meadows. Microorganisms; invertebrates; vertebrates; marine plants; Turtles seabirds and marine mammals. Marine protected areas; conservation strategies; IUCN categories. Human Impacts, disaster and its management: sea ranching; Artificial reef. Marine Pollution and management: point and non-point source pollution; oil pollution; plastic pollution; microplastic pollution; heavy metal pollution; nutrient pollution, pesticide pollution; PHC pollutions, thermal pollution, nuclear pollution ballast waters and its impact.

Unit X: Biostatistics (5 Questions)

Biostatistics: Sampling techniques, Central Values (Mean, Mode, Median), Dispersion: absolute relative probability: Binomial Properties, Problems, Fitting Positions, Normal, Skewness, Kurtosis, Correlations and Regressions - Simple Linear Testing – large sample. T-test, Chi square Test – Two-way ANOVA Experimental Design – Principles. CRD, RBD, LSD, Missing Plots – Figurative Representation (Bar diagram, Pie chart etc).

12. Evaluation and Applied Research (PG Degree Standard)

Code: 213

Unit I: (5 Questions)

Indian Economy – Growth and development: Agriculture: Area, Yield, Production, marketing and sales. Rural Development – Industry: Input and output – Service Sector : Types of service sector, skilled labour, semi skilled labour and unskilled labour – Changing Sectoral contributions – Industrial Policy Changes – FDI – Infrastructure: Public Health – Education – drinking water – sanitation – Public transport –Banking and financial services–housing facilities–Nutrition – Investment – Public Private Participation – Inclusive growth. Human Development: Concepts, Trends and Issues – Employment, unemployment, under employment and disguised unemployment – concepts, measurement and Trends – Employment in Organized and unorganized sector – Strategies for Employment Generation. Poverty: Concepts, measurement and Trends, Fiscal Policy – FRBM Act – Goods and Service Tax (VAT) – Fiscal Federalism – Parallel economy in India – Inflation: Definition, trends, estimates, consequences and remedies – RBI – Monetary and Fiscal policy – Banking Sector Reforms – India's foreign trade, composition, direction and recent changes in trade policy – Balance of payments – India and WTO requirements – Global Financial Crisis and its Impact on India. Index number: Consumer price index – Whole Sale price Index. Time series analyses-Moving average Method

Unit II: (5 Questions)

Primary data collection - Field Investigation - Census method - Sampling Method – Direct personal observation - Interview method - Indirect oral interview - Information through agencies - Mailed Questionnaires and scheduled sent through enumerator. Secondary data collection - Books – Journals - Government (Ministry) Records and reports from government agencies – Bibliography – Autography - Web site - News Paper - Periodicals, etc Evaluation and preparation of the report and components of evaluation Report: Executive summary-background and purpose - statement of the problem - objectives and Hypotheses – evaluation methods (Statistical methods used in the study) – result and discussion of the result – conclusion and recommendation - reference or bibliography - appendices.

Unit III: (10 Questions)

Econometrics - definition, methodology, Data – meaning and types of data such as cross-section, time-series and panel data, primary & secondary data- advantages & disadvantages, Variables – meaning and types such as quantitative and qualitative variables, measurement scales of variables such as ratio, interval, ordinal and nominal - simple examples. Correlation – simple and multiple correlation, properties of correlation coefficients, Karl Pearson's and Spearman's rank correlation coefficients, Simple numerical problems - Simple & multiple linear regression model – introduction, assumptions, least squares principle, least squares estimators, properties of regression coefficients (Gauss-Markov theorem), interpretation of regression output - R^2 & adjusted R^2 , regression coefficients with t-values and level of significance, Simple numerical problems - advantages of regression analysis over correlation analysis, Functional forms of regression models – log-linear, log- lin and lin-log models and computation of elasticity, computation of simple and compound growth rates - simple numerical examples.

Unit IV: (10 Questions)

Econometric Problems: heteroscedasticity, multicollinearity and autocorrelation – definition and consequences. Dummy variables: definition, generation of dummy variables, problem of dummy variable trap, cautions in using dummy variables, inclusion and interpretation of dummy variables in the regression. Qualitative response regression models – linear probability, logit and probit models – an introduction. Basics of time-series: additive and multiplicative models, determination of trend by free drawing, moving average methods, and seasonal indices, definition of stationarity, tests for stationarity and transformation of non-stationary series into stationary series.

Unit V: (5 Questions)

Compilation and Tabulation of data Collected - Classification – Types of Classification – Formulation of discrete and continuous frequency distribution (uni-variate and Bi- variate). Pictorial Representation of data: Bar diagrams – Pie diagrams – Histogram – Ogives and Lawrence Curve Measures of Location – Mean, Median, Mode, Harmonic Mean and Geometric Mean – Quartiles - Measures of variation: Range, Quartile deviation, Mean deviation, Variance and Standard deviation. Coefficient of variation, skewness and Kurtosis. (All the calculation of measures are for both grouped and ungrouped data) Probability and Distribution: Introduction to probability: Random Experiments, Sample Space and events, Definition of probability. Classical, Empirical and Axiomatic approach to probability; Addition and Multiplication Theorem, Conditional probability and Baye's Theorem. Random Variables and Distribution function – Mathematical Expectation and conditional Expectation. Convergence in Probability – Weak Law of large Numbers and strong law of large Number – Central limit Theorem – Discrete distributions: Binomial, Poisson. Continuous Distributions: Normal Distribution Chi-Square, t and F distributions and their properties.

Unit VI: (10 Questions)

Application of Statistical Methods - Sampling Theory: Introduction to the theory of Sampling: Sampling designs – Simple Random Sampling with and without replacement - Systematic, Stratified, Ratio and Regression Sampling methods, Sampling and non – sampling errors – Cluster sampling, Purposive Sampling Quota Sampling. Testing of Hypothesis: Introduction to Testing of Hypothesis: Simple, Null and Alternative hypotheses, composite hypothesis, two kinds of Errors – Critical Region – Power function. Testing of significance using chi-square, t and F tests. (simple problems) ANOVA - One way and Two way classifications. Application of Statistical Methods through MS-Excel – Language : Over view of MS-Excel: Construction of charts and diagrams – Sorting – Filtering – Removing duplicates – Calculation of Measures of Central tendency, Measures of dispersion, correlation Regression and curve fitting using – Excel.

Unit VII: (10 Questions)

Theory of Consumer Behavior - Utility and its measurement - Indifference curve analysis and Consumer's surplus. Demand and supply functions - Elasticity of demand and supply - Factors affecting demand and supply. National Income - Concepts and measurement. Classical and modern theories of Employment. Consumption function - Investment and savings. Concept of Multiplier and Accelerator. Inflation - Nature, Effects and controlling mechanisms. Monetary policy and Fiscal policies and Role of RBI. Types of Market Structure - perfect competition, monopoly, monopolistic. competition, oligopoly and price determination.

Agricultural marketing - Characteristics of Agricultural products and constraints in marketing agricultural produce. Marketable and Marketed surplus estimation. Estimation of price spread and Marketing Efficiency. Market integration, Marketing Intelligence and Marketing Acts. Institutions in Agricultural Marketing - Regulated Markets, Cooperatives, Commodity Boards, Contract Farming, Commodity Exchanges, Farmers' Markets and Farmers Producers Organizations. Commission on Agricultural Costs and Prices - Agricultural Price fixation and price support programs and policies. Price forecasting. Supply chain Management and logistics. Development planning in India - Agriculture in five year plans. Land tenure and reforms. Unemployment, Poverty and inequality. Food and nutritional security. Population policies. Income distribution - Social Choice Theory - Public goods Welfare economics. Rural Indebtedness. Financial Institutions and Credit Flow to Rural/ Priority Sector. Agricultural Lending - Direct and Indirect Financing - Financing through Co- operatives, Commercial Banks and RRBs - Role of Lead Bank and NABARD - District Credit Plan. Credit linked Rural Development Programs - RIDF. Micro-Financing - Role of MFI's, NGO's, and SHG's. Credit Inclusion – Credit Widening Credit Deepening. Risk in agriculture and different Crop Insurance Programs - Agricultural project preparation - project cycle - Costs and benefit analysis – Discounted and Undiscounted Measures – Sensitivity analysis. Technical feasibility of economic viability of projects. Use of Network techniques – Project monitoring and evaluation. Forms of production functions – Returns to scale vs Economies of scale. Cost of cultivation vs Cost of Production – Cost concepts – Fixed Cost, Variable cost, Average Cost and Marginal cost. Efficiency Measures – Technical and Economic Efficiency. Financial statements and ratio analysis. Partial and complete budgeting and their applications.

Unit VIII: (15 Questions)

Concepts, Classification and Problems of Natural Resource Economics. Economy and Environment interaction. Resource scarcity – Limits to Growth – Measuring and mitigating natural resource scarcity– scarcity indices. Malthusian and Ricardian Scarcity. Theory of optimal extraction of exhaustible and renewable resources. Property rights – Issues in natural resource management – private property, common property and open access resources – Collective action in common property resource management. Land use planning – optimal management of land, water, forests and fisheries. Resource mapping – GIS and remote sensing applications. Environmental problems and quality of environment – Economics of the environment –Theory of externality. Sources and types of pollution – air, water, solid waste, land degradation – Environmental and economic impacts. Economics of pollution control – efficient reduction in environmental pollution. Environmental regulation – Economics instruments and indirect instruments (command and control policies). Environmental legislations in India. Concept of sustainable development – Indicators of sustainability. Environmental Accounting – resource accounting methods. Climate change and its impacts – mitigation efforts and international treaties. International Trade and Comparative Advantage. Terms of Trade and Instruments of Trade Policy – Tariffs and Non tariffs. Balance of Trade vs Balance of payments. Exchange Rates. International Organizations – IMF, IBRD, IDA, IFC. WTO. Fundamental vs. Applied Research – Qualitative vs Quantitative Research. Research Prioritization – Identification of Research Problems and Prioritization. Research Process. Trade-off between scope and cost of the study. Research Design and Techniques. Hypothesis – Meaning – Characteristics – Types of Hypothesis and Testing. Setting of Objectives and Hypothesis. Sampling Theory and Sampling Design. Sampling Error. Sampling methods – Probability and Non-Probability methods. Interviewing Techniques – Questionnaire vs Interview schedules and Field Problems – Methods of Conducting Survey. Types of data – Primary and Secondary data. Sources of Secondary Data and Data collection techniques. Types of questions in interview schedule – Structured, Unstructured, Open Ended and Closed-Ended Questions. Data coding and data entry. Data Tabulation and Validation of Data. Data Processing. Application of Analytical tools to data – Simple and Multiple regression and problems in estimation – Multicollinearity, Heteroscedasticity and Autocorrelation. Optimization Models – Linear Programming: Concepts and theories. Problem formulation – Minimization and Maximization problem (Primal and Dual solutions). Sensitivity analysis. LP in farm planning and regional planning. Risk Programming and dynamic programming techniques.

Unit IX: (10 Questions)

Nature and Scope of Sociology, Sociology as a Science. Individual and Society. Social Process: Competition, conflict, Co- operation, Accommodation, Assimilation, Social control. Social Institutions:

Family and Marriage. Theoretical Perspectives:- Structural Functional Perspective: August Comte, Herbert Spencer, Max Weber, Emile Durkheim, R.K. Merton. Conflict Perspective: Karl Marx, Ralf Dahrendorf and L. A. Coser. Caste System in India: Origin of the caste system; cultural and structural views about caste; mobility in caste; change and persistence of caste in modern India; views of Gandhi and Ambedkar about caste system. Class Structure in India: Agrarian and industrial class structure; emergence of middle class. Rural Social Structure: Village Social Structure and Importance of Village Studies. Peasant society and agrarian systems; land tenure systems, social consequences of land reforms and green revolution. Agrarian unrest and movements in India. Rural social problems in India: poverty, unemployment, indebtedness, farmer's suicide and bonded labour. Strategies of rural development programmes. Tribal Societies in India: Type and distinctive features of tribal communities in India and their geographical spread. Problems of tribal communities: land alienation, poverty, indebtedness, health and nutrition, education, Integration and issues of tribal identity. Tribal development policies after independence.

Unit X: (10 Questions)

Socio-religious reform movements: Bhakthi Movements, Arya Samaj, and Ram Krishna Mission. Backward Class Movements: Satya Sadhak Samaj, Sri Narayanguru Dharma Paripalana Movement (SNDP), Self-respect movement, Dalit Movements, Political Mobilization of Backward Classes. Women in Indian society: Socio-cultural interpretation of women in India. Demographic profile of women. Problems of Women in India: dowry, domestic violence, discrimination, female infanticide, honor killing, sexual harassment. Women empowerment programmes and SHGs. Social Research: Meaning of Social Research, Scope and Importance of Social Research. Types of Research, Research Process: Identification and formulation of research problem. Methods of Research: Descriptive and Explorative methods. Sampling Methods, Methods of Data Collection. Tools of Data Analysis: Univariate and Bivariate Statistics, Chi-square Test. Application of ICT in Social Research. Evaluation Research: Meaning and aims of evaluation research. Types of evaluation and their purpose. Levels of measurement: population-based vs. program-based. Sources of data. Study designs. Impact Assessment Research: Programmes and policy evaluation research. Environmental impact assessment research. Research Report Writing: Organization of a research report: Title, Abstract, Introduction, Experimental Details or Theoretical Analysis, Results, Discussion, Conclusions and Summary, References. Quality of good research report. Significance of research report.

Unit XI: (5 Questions)

Public Administration Theory and Principles - Public Administration: Meaning and scope and significance – Public vs Private Administration – Approaches to the study of Public Administration-Comparative Public Administration – Development Administration - New Public Administration – New Public Management - Principles of Organization and Administration – Classical theories – Human Relation theories – Modern theories of administration – Bureaucratic culture-Administrative Responsibility and Ethics.

Unit XII: (15 Questions)

Public Administration in Practice - Public Financial Administration: Budgetary process and accountability, Union – State financial relations in India – Good Governance: Social welfare schemes in Tamil Nadu, Women Empowerment schemes in Tamil Nadu, Health care Policy in Tamil Nadu – E. Governance : ICT application in government – IT parks in Tamil Nadu – District administration: e-governance in Districts, THAI scheme, Pudhuvazhvu scheme – Special Economic Zones – Panchayat Raj: Rural Development programmes in Tamil Nadu, Environmental protection in Tamil Nadu – Administrative reforms: Personnel and Administrative Reforms, Urban Governance: Urban Local bodies in Tamil Nadu, Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in Tamil Nadu – Tamil Nadu Urban Development Project – Human Rights governance: the Tamil Nadu State Human Rights Commission- Social Science Research: Meaning, nature and scope of social science research- Qualities of good researcher-Types of social science research: Historical -Descriptive - Empirical – Experimental - Qualitative- Quantative – Hypothesis – Variables -Sampling: Probability and Non-Probability sampling – Methods of Data Collection: Primary and Secondary data- Observation-Schedule- Survey-Interview-Questionnaire-Measurement - Data Analysis-Tabulation-Inferences- Research Design and Report.

Unit XIII: (15 Questions)

Social work research - Scientific Method: Objectivity, Scientific attitude, Ethics in research; Types of Research: Applied and Pure, Quantitative and Qualitative, Mixed methods, Participatory, Action research, Evaluative, Field based research. Research as a method in Social Work. Research process: Classification of Variables, Concepts, Constructs, identifying and formulating research problem, research questions, defining objectives, hypotheses. Research Designs: Exploratory, Descriptive, Diagnostic, Experimental, Evaluative and Participatory. Sampling Methods : Probability and Non- probability sampling techniques. Data Collection: Types of data, data collection methods, Questionnaire, Interview Schedule, Interview Guide, Observation (Participatory and non participatory) Qualitative Research techniques: FGDs, In-depth interview, Transcription, Themes, Illustrative quotes. Appreciative inquiry technique. Photo voice technique. Social Audits. Triangulation and Iteration.

Unit XIV: (10 Questions)

Project evaluation - Project identification and formulation – Classification of projects, Project objectives, Project life cycle and phases, Project Planning and Organization. Project feasibility analysis (Financial, Technical) Market Survey, Demand analysis, Forecasting and Projection. Terms of reference: Area of study, documents needed, process, time frame, Team members. Evaluation design; Types of Evaluation; Project design: Time management, sequencing and scheduling, Network Analysis, CPM and PERT, Logical Framework Approach (LFA), Problem Analysis and Problem Tree. Log Frame Matrix, Social Cost – Benefit analysis, Environmental Impact Assessment, Legal aspects and clearance. Factors such as efficiency, effectiveness and sustainability of the project. Project appraisal and Implementation: Project Appraisal methods: (Financial, Technical) Project Financing, Project Resource mobilization, Negotiation, Decision making, Project control and Monitoring techniques, Project evaluation: Tools of Evaluation: Ladder of Life (UN tool). Community impact assessment, Holistic World View Analysis, Vulnerability Assessment, Impoverishment assessment, FGDs and Reporting on Evaluation.

Unit XV: (10 Questions)

Basics and Major areas of Management - Concept and Foundations of Management – Managerial Functions – Planning and decision making, Organizing, co-ordination and control – Role of Manager – Managerial skills – Management of innovation –Personality Theories and Determinants – Meaning and Process of perception – Motivation Concepts, Theories and Applications. Leadership – Theories and Styles – Quality of Work Life (QWL) – Quality Circles (QC) –Management of Conflicts in Organizations – Demand analysis and forecasting – cost functions – Break-Even-Analysis - Theory of firm-profit maximization and sales maximization – Pricing decisions under different market structures. National income- GNP, GDP, Gross Domestic savings – Monetary and Fiscal policies – Business cycle. Fundamentals of operations management – Aggregate production planning, capacity planning – plant design – process planning – plant size and scale of operations – Management of facilities –Production control – Supply chain management - Quality management – statistical process control-role and importance of material management – Modern production concepts – JIT, Kaizen, Japanese 5's framework. Nature and scope of financial management – finance function- valuation concepts and Valuation of securities- financing decisions- sources of finance- cost of capital and capital structure – Investment decisions – Capital budgeting – Working capital management – Dividend decisions. Marketing Management – evolution and scope – Marketing strategy formulation and components of marketing plan – Segmenting and targeting the market – Positioning and differentiating of the market – Analyzing competition – Analyzing consumer markets – Industrial buyer behavior – Marketing research – Product strategy – Pricing strategies – Designing and managing Marketing channels – Building customer satisfaction –Ethics in marketing – Consumer protection - Concepts and policies of HRM – HRM functions – Future challenges of HRM-Human resource planning – Job analysis – Job evaluation – Recruitment and selection – Training and development – Promotion and transfer – compensation – performance appraisal and 360 degree feedback – HR audit – Handling of sexual harassment in the work place-current trends and issues in HRM. Nature and scope of strategic management – Strategic intent, vision, objectives and policies – Process of strategic planning and implementation – Environmental analysis and internal analysis – SWOT analysis – Tools and techniques for strategic analysis – Impact matrix – The experience curve – BCG matrix – Balanced Score Card - Du Pont's control model.

Unit XVI: (15 Questions)

Research methodology and management information system - Research – meaning, scope and objectives-types of research – research design-Data collection and Tabulation – Questionnaire design – Scaling technique – sources of secondary data– Sampling – Probability – Correlation and Regression Analysis – Tests of Significance – Normal distribution, Chi-square, F and t tests, ANOVA, time series and forecasting decision theory, index numbers – Multi-Variant analysis, Factor analysis – Discriminate analysis – report writing – Types of Report – structure of the Report – Guidelines for Report writing . Conceptual foundations of information systems – Types of information systems - Element of information system – Data Vs. Information – information requirement at various levels – data processing – data base – Data Entry -Development and Management – Systems analysis and design – Trends in information technology – Flexibility in information systems – User involvement – Evaluation of information systems – Security and ethical challenges.

Unit XVII: (10 Questions)

Algebra and Differential Equations - Groups: Groups – Sub groups – Normal subgroups and quotient subgroups – Homomorphisms – Automorphisms – Cayley's Theorem – Rings: Rings - Special class sub rings - Homomorphisms – Ideals and Quotient Rings – Vector Spaces: Basic Concepts – Linear Independent and Bases – Inner Product Spaces – ODE: ODE with constant coefficients – ODE with variable coefficients – Higher order ODEs – PDE: First order PDE - Second order PDE – Elliptic, parabolic, and hyperbolic PDEs.

Unit XVIII: (10 Questions)

Analysis - Real Analysis: Properties of monotonic functions - Functions of bounded variations – Total variations – Additive property of total variation – Total variation on $[a,x]$ as a function of x - Continuous functions of bounded variations – Infinite Series: Absolute and conditional convergence – Dirichlet's test and Abel's test Rearrangement of series – Riemann's theorem on conditionally convergent series.– Complex Analysis: Differentiability and Cauchy-Riemann Equations – Harmonic Functions – Power Series as an Analytic Function – Complex Integrations – Cauchy Integral Formula – Morera's Theorem – Existence of Harmonic Conjugate – Taylor's Theorem – Conformal mappings – Functional Analysis: Metric Spaces – Convergence, completeness and Baire's Theorem - Continuous mappings - Space of continuous functions - Euclidean and Unitary spaces - Topological Spaces: Basis for a Topology – The Product Topology - The Metric Topology – Connected Spaces – Connected Subspaces of the Real Line Components and Local Connectedness. Decision Making: Basic Statistics: Moments - Mean – Variance – Standard deviations – Linear regression – Rank correlations – Attributes – Index Numbers. Linear Programming Problem: Graphical Methods – Travelling Salesman Problem – Assignment Problem – Simplex Methods.

Unit XIX: (10 Questions)

Anthropology, meaning scope and relationship with other disciplines particularly social sciences, humanities etc. Main branches, their scope, The nature of culture, The nature of society: concept of society, society and culture, social institutions, social stratification Marriage: Definition and universality, Family, Kinship, Economic organization: meaning, scope, and relevance of economic anthropology, Religion Research methods in Anthropology - Field work tradition in Anthropology - Distinction between techniques, methods, methodology - Tools of data collection, observation, interview, schedules, case study, genealogy etc.

Unit XX: (10 Questions)

Evolution of the Indian culture and civilization: Palaeolithic, Neolithic, Harrappan cultures; Tribal cultures of India, Brief ethnographic details of Tribes of Tamil Nadu. Caste system in India: Structure and characteristics, theories of origin of caste, Dominant caste. Indian village: Indian village as a social system, peasant cultures. Cultural change in Indian Society: Sanskritization, Westernization, Modernization, Post Modernism, Globalization; Problems of the tribal communities a) poverty b) low literacy c) health Development of forest policy and Tribals Constitutional safe guards for ST/SC, Role of Anthropology in Tribal and Rural development. Demographic profile of India – Ethnic and Linguistic elements in the Indian population and their distribution. Gender issues in Tamil Nadu.

13. Fisheries Science and Zoology (Degree Standard)

Code: 559

Unit I: Fish Biology, Resource Management and Regulations (20 Questions)

Systematics – Binomial nomenclature: classification of elasmobranchs, teleosts, crustaceans, and molluscs; external morphology – morphometric – meristic and anatomy of finfish and shellfish, DNA barcoding – Karyo taxonomy, Food and feeding habits – Gastro somatic index- length weight relationships – age and growth – reproductive strategies – breeding – maturation and spawning – Gonado – somatic index, fecundity and developmental biology of commercially important finfish and shellfishes – physiology – respiration, circulation, digestion, excretion, osmoregulation – reproductive physiology – endocrine glands and sex hormones. Fish genetics - Sex determination, hybridization, fish breeding techniques – Cryopreservation of gametes -Commercially important marine fishes, shellfishes, crustacean and seaweed resources of India and world, fish population dynamics – Vonbertalanfy's growth equations- growth and mortality parameters – Maximum Sustainable Yield – Maximum Economic Yield – CPUE-Yield per recruit-fish stock assessment Methods – Fish stock enhancement - growth - recruitment overfishing – Closed season – mesh size regulation – Turtle Excluder Device - Tamil Nadu Marine Fishing Regulation Act – Wildlife Protection Act – Coastal Aquaculture Authority Act.

Unit II: Aquaculture, Ornamental Fish Culture and Fish Diseases (30 Questions)

Site selection for fish culture – Chinese hatchery - cultivable fishes for freshwater- Pond chemistry – Dissolved Oxygen – Alkalinity, Hardness– Pond disinfection with lime -Soil and water quality management – Types of feed and formulation - integrated fish farming – sewage fed fish culture – cold water Fisheries - brackish water aquaculture - Shrimp culture – shrimp hatchery and nursery rearing- seed certification - culture techniques of bivalves, Mariculture- candidate species for Mariculture, Open water cages – Seaweed culture - Scampi culture -Ornamental fish culture – Live bearers - Egg layers- culture of Fish food organisms- Aquarium keeping – fish diseases -Bacterial, Fungal, viral and parasitic diseases - remedial measures - Recent Aquaculture techniques.

Unit III: Limnology, Aquatic Ecology and Biodiversity, Fishery Oceanography, Aquatic Pollution, Coastal Zone Management (20 Questions)

Physico – chemical characteristics of freshwater bodies; lentic and lotic systems, flora and fauna, classification of lakes based on origin, productivity & mixing of water; phytoplankton and zooplankton, nekton, benthos, Estimation of primary production; Components of aquatic ecosystems, food chain, energy flow, animal association; Ecological niches – lagoons, estuaries, mangroves, coral reefs, flood plains, wet lands- exotic species- endangered species, conservation of habitats Marine zones – physical properties of sea water –chemistry of sea water- waves, tides, currents, El -Nino, Ekmanspiral, upwelling; Aquatic pollution -BOD,COD, oxygen demanding waste, eutrophication-sewage pollution, red tide- oil pollution, pesticide pollution, thermal pollution, radioactive pollution- biological indicators of pollution; Application of GIS in aquatic resource identification- remote sensing for coastal management - CRZ - Environmental Impact Assessment.

Unit IV: Fisheries Economics, Statistics, Fisheries Marketing & Fisheries Extension (10 Questions)

Theories of demand and supply, market equilibrium, production function in capture and culture fisheries, Economics of fishing and fish farming, fish marketing; marketing channel, export and import policies; bar diagram, pie diagram, histogram, frequency polygon, primary and secondary data for statistical analysis, extension teaching methods and use of audiovisual aids in extension activities, individual group and mass contact methods.

Unit V: Fishing Craft and Gear Technology, Navigation and Seamanship, Refrigeration and Equipment Engineering (20 Questions)

Types of fishing gears & crafts – fishing gear materials and their properties– yarn numbering system – Fishing gear accessories, floats, sinkers, etc.-design and construction of gill nets longline, trawls and purse seine- Fish finding devices. Principles of hydrostatics, law of floatation – Archimedes principle – Simpson's rules Fishing craft materials – wood, steel, FRP- form co-efficients, TPC– ship's stability– state of

equilibrium- care and maintenance of vessels; types of propeller and rudder; Principles of navigation and seamanship – chart reading and fixing positions- chart symbols Compass, GPS–EPIRB- Rules of road related to fishing vessels – navigational lights-International code flags-life saving devices- buoyage system, storm signals, distress signals - Laws of thermodynamics-vapour compression refrigeration- vapour absorption refrigeration-Compressor, evaporator, condenser – Freezers – plate, blast, tunnel-refrigerated- coefficient of performance sea water systems; Types and functions – operation and maintenance of various processing equipments - types of diesel engines and their working principles – marine engines.

Unit VI: Fish in Nutrition, Fish Processing Technology and Packaging Technology (25 Questions)

Nutritional value of fish- protein, non -protein, nitrogen, lipid, minerals, micro and macro element, trace elements, other functional biomolecules in fishes. Freshness of fish and rigor mortis – mechanisms of fish spoilage – fish drying methods – principles of salting and salt curing methods – smoking of fishes. Canning materials – canning media – methods of canning – quality of canned fishery products. Spoilage of canned foods, types, causes and preventive measures-packaging materials for canned foods. Fish preservation by chilling and icing – preparation of ice-chemicals used in freezing – types of freezing changes during frozen storage– method of thawing. Microbiological and biochemical changes in freezing – packaging and transport of frozen fishery products – freeze drying - Packaging materials and their properties-packaging for retail sale and storage- retort pouch packing, vacuum packaging, active packaging, MAP. Fishery by products – Fish meal- fish oil- shrimp waste- chitin –chitosan-fish protein concentrate- fish hydrolysate- fish silage – fish maws, fish glue- gelatin-isinglass-utilization of seaweeds –agar agar – algin – carrageenan.

Unit VII: Microbiology of Fish and Fishery Products, Quality Assurance of Fish and Fishery Products (15 Questions)

Source and types of microorganisms in fish and fishery products-Indicators of microbiological quality of fish and fishery products-nutritive values of processed seafood. Quality dimensions of sea food-assessment of quality changes in fresh and iced fish and during processing- application of HACCP concept in quality assurance- Role of EIA and MPEDA in fish and fishery products- Certification system for fish and fishery products –sea food safety – authenticity – traceability.

Unit VIII: Invertebrates and Chordates (25 Questions)

Invertebrates: General Organization and Classification upto Classes. Organization of Coelom – Acoelomates, Pseudocoelomates and Coelomates. Economic importance of Protozoans. Canal System in Sponges. Metagenesis and Polymorphism in Coelenterates. Helminthes in relation to man. Metamerism in Annelids. Larval forms and Parasitism in Crustaceans. Chordates: General Organization and Classification upto Classes. Ascidian – Retrogressive Metamorphosis, Neoteny and Affinities. Fishes – Locomotion, Migration, Respiration and Parental Care. Amphibia – Respiration and Parental Care. Reptiles – Identification of Poisonous and Non-poisonous Snakes. Birds – Flight Adaptations and Mechanism of Flight – Flightless Birds. Mammals – Dentition – Prototheria, Metatheria, Eutheria and their Phylogenetic relationships.

Unit IX: Cell & Molecular Biology, Biochemistry, Physiology, Biophysics, Genetics and Evolution (20 Questions)

Cell and Molecular Biology: Structure and Function of Cellular Organelles – Cell Division and Cell Cycle – Structure & Functions of Genetic Materials – Lac Operon Concept. Biochemistry: Structure and Functions of Biomolecules. Hormones – Classification, Biosynthesis and Function. Physiology: Digestion, Circulation, Respiration, Nerve Impulse and Conduction, Excretion, and Reproduction in Mammals. Biophysics: Centrifugation, Colorimetric Techniques, Electrophoresis, PCR, RFLP, RAPD and DNA fingerprinting. Genetics: Mendelian Principles – Mutation – Chromosomal Aberration: Structural and Numerical. Evolution: Origin of Life and Theories of Evolution

Unit X: Biostatistics, Immune System, Developmental Biology and Ecology (15 Questions) –

Biostatistics: Mean, Median, Mode and Standard Deviation. Basics of Bioinformatic Tools – DNA and Protein Sequence Analysis. Immune System: Types and Functions – Vaccination. Developmental Biology:

Gametogenesis, Fertilization, Cleavage, Gastrulation and Organogenesis. Ecology: Ecosystem – Structure and Function – Ecological Succession – Population Ecology – Biodiversity and its Conservation.

14. Financial and Cost Accountancy (Intermediate Standard)

Code: 433

Unit I: Accounting (10 Questions)

- a) Accounting Standards (old) 2,10,12 and 16
- b) Accounting for Cooperative Societies
- c) Branch and Departmental Accounts (including foreign branches)
- d) Accounting for non-profit organizations and incomplete records
- e) Computerized Accounting System

Unit II: Auditing (20 Questions)

- a) Nature and scope and significance of auditing
- b) Audit Engagement, Audit Programme, Audit working papers, Audit note book audit evidence and audit report
- c) Internal check, internal control and internal audit– industry specific
- d) Auditing of difference types of undertaking– education, hospitals, cooperative societies, trusts, municipalities

Unit III: Financial Management (30 Questions)

- a) Meaning–objectives –scope of financial management
- b) Tools for Financial Analysis– Ratio, Cash flow analysis
- c) Analysis and Interpretation of Financial Statements
- d) Investment decisions–ARR, Pay back, NPV, IRR, PI
- e) Cost of Capital Structure and Leverages
- f) Working Capital Management – Financing – Cash, Inventory, Receivables and Payables

Unit IV: Direct Taxation (10 Questions)

- a) Heads of Income and Computation of Total Income under various heads
- b) TDS/TCS/Advance Tax
- c) Taxation as applicable to Government undertaking and Cooperative Societies.

Unit V: Indirect Taxation (30 Questions)

- a) Canons of Taxation
- b) Goods and Services Tax (GST)
 - a. CGST-SGST-IGST- Cess
 - b. Registration – Supply – Time of Supply – Value of Supply – Place of Supply – Input tax credit – Reverse Charge Mechanism (RCM) – Payment of Taxes.
- c. Filing of GST periodic returns

Unit VI: Commercial Law, Industrial Law & Company Law (20 Questions)

- a. Indian Contract Act
- b. Sale of Goods Act
- c. Negotiable Instrument Act
- d. Factories Act, Payment of Gratuity Act
- e. Employees Provident Fund Act 1952
- f. Employees State Insurance Act 1948
- g. Payment of Bonus Act 1965, Minimum Wages Act 1948
- h. Tamil Nadu Tender Transparency Act, 1998

Unit VII: Cost Accounting: Prime Cost and Overheads (20 Questions)

- a) Material Cost
 - a. Purchase procedures, ledgers and forms (MRN, GRN etc.)
 - b. Inventory levels management
 - c. Stores ledger under FIFO, Weighted average, retail price
 - d. Physical stock taking and inventory reconciliation
 - e. Wastage and shortage
- b) Labour
 - a. Remuneration methods
 - b. Measuring production and productivity
 - c. Incentive Schemes: Halsey, Rowan, Taylor
 - d. Labour Turnover
- c) Overhead
 - a. Cost grouping, allocation and apportionment
 - b. Treatment of under and over absorption
 - c. Machine hour rate computation

Unit VIII: Cost Accounting: Book Keeping and Methods (15 Questions)

- a. Costing accounting records, Ledgers, Cost statements
- b. Items excluded from cost and normal and abnormal, terms/cost
- c. Integral accounts
- d. Reconciliation of cost accounting records with financial accounts
- e. Process, job, contract, and Batch costing
- f. Service costing: hospital, transport, hotel etc.

Unit IX: Cost Accounting: Techniques (15 Questions)

- a) Marginal costing
 - a. CVP analysis
 - b. Break even point and Margin of safety
 - c. Break even chart
 - d. Cost indifference point
 - e. Key factor analysis
- b) Standard costing and variance analysis
 - a. Material
 - b. Labour
 - c. Variable Overheads
 - d. Fixed Overheads
 - e. Sales variances
 - f. Sales margin variances

Unit X: Budget and Budgetary Control (30 Questions)

- a. Concepts, Types of Budgets
- b. Budgetary Control Vs Standard Costing
- c. Advantages and Limitations
- d. Preparation of Various Budgets
- e. Zero Base Budgeting

**15. Financial and Cost Accountancy
(Final)****Code: 434****UNIT I: Accounting (30 Questions)**

- (i) Accounting Standards – GAAP - AS - applicability, interpretation, scope and compliance-IFRS- Ind AS 2, 10, 115, 16, 21, 20, 23, 37 & 38.
- (ii) Company Accounts - Presentation of Financial Statements as per Schedule III of Companies Act 2013 - Statement of Profit or Loss, Balance Sheet, Change in Equity, Cash flow statement

- (iii) Accounting of Banking, Electricity and Insurance Companies
- (iv) Accounting for Cooperative Societies
- (v) Branch and Departmental Accounts (including foreign branches)
- (vi) Accounting for non-profit organisations and incomplete records
- (vii) Computerised Accounting System (ERP features and advantages)

UNIT II: Auditing (30 Questions)

- (i) Nature and scope and significance of auditing
- (ii) Audit Engagement, Audit Programme, Audit working papers , Audit note book audit evidence and audit report
- (iii) Internal check, internal control and internal audit- industry specific
- (iv) Reporting requirements under companies act - report vs certificate, contents of the report and qualifications in the report.
- (v) Cost audit and Secretarial audit
- (vi) Auditing of different types of undertaking - education, hospitals, cooperative societies, trusts.

UNIT III: Financial Management (25 Questions)

- (i) Meaning-objectives -scope of financial management
- (ii) Sources of Funds- Introduction of Financial Markets- Capital & Money Markets
- (iii) Tools for Financial Analysis - Ratio, Funds flow analysis, Cash flow analysis
- (iv) Cost of Capital, Capital Structure and Leverages
- (v) Working Capital Management- Financing - Cash, Inventory, Receivables and Payables
- (vi) Capital Budgeting.
- (vii) Risk Management - risk measurement- risk analysis- Value at Risk(VAR)- Capital Adequacy Norms & Income Recognition Norms (NPA) in NBFCs.

UNIT IV: Taxation (30 Questions)

- (i) Direct Taxation- Residential Status- Heads of Income and Computation of Total Income under various heads- assessment of income of different persons - TDS/TCS/Advance Tax- Income Computation and Disclosure standards (Basic Concepts only) - Taxation as applicable to Government undertaking and Cooperative Societies. Due dates and compliances. Effects of non compliance and penalty. Tax audit provisions under I.T. Act
- (ii) Indirect Taxation- Canons of Taxation- Customs Law - Goods and Services Tax (GST) - CGST-SGST-IGST- Cess - Registration - Supply- Time of Supply- Value of Supply- Place of Supply- E-Invoicing, E-Way Bill, Input tax credit- Reverse Charge Mechanism (RCM) - Payment of Taxes, Penalties.

UNIT V: Commercial Law, Industrial Law and Company Law (20 Questions)

- (i) MSMED Act 2006.
- (ii) Laws and Regulations relating to Cyber Security and Data Protection.
- (iii) Factories Act
- (iv) Payment of Gratuity Act
- (v) Employees Provident Fund Act 1952
- (vi) Employees State Insurance Act 1948
- (vii) Payment of Bonus Act 1965
- (viii) Minimum Wages Act 1948
- (ix) Companies Act 2013-Promotion - Formation and related procedures – Types – Appointment and duties of Directors, Loans and Deposits, CSR, Salient features of Insolvency and Bankruptcy Code.

UNIT VI: Management Accounting (15 Questions)

- (i) Introduction to Management Accounting - Relationship between Management accounting and cost accounting- Decision Making tools
- (ii) Analysis and Interpretation of Financial Statements
- (iii) Learning Curve - concepts and its application

UNIT VII: Cost Management (10 Questions)

- (i) Life Cycle costing
- (ii) Target Costing
- (iii) Kaizen Costing
- (iv) Value analysis and Engineering
- (v) Throughput Costing
- (vi) Business Process Re-engineering
- (vii) Back flush costing
- (viii) Activity Based Costing (ABC).

UNIT VIII: Decision Making Techniques (15 Questions)

- (i) Marginal Costing - CVP analysis - Profit Volume Graph- Decision involving alternative choices - Make or Buy; Evaluation of Orders; Multiple scarce: Product sales
- (ii) Pricing Decisions - New Product pricing- use of costs in pricing - sensitivity analysis - monopoly pricing - competitive pricing- Transfer pricing - Costing of Service Sectors
- (iii) Variance Analysis and Reporting- Material, Labour, Overheads, Turnover and Profit.

UNIT IX: Performance Evaluation and Improvement Tools (15 Questions)

- (i) Balanced Score Card
- (ii) Supply Chain Management
- (iii) Key Performance Indicators (KPI) like ROI, Economic Value Added (EVA).
- (iv) Bench Marking
- (v) Six sigma, Statistical Quality Control
- (vi) Plan-Do-Check Action
- (vii) Management Information Systems (MIS)
- (viii) Total Productivity Management (TPM) and Total Quality Management (TQM)
- (ix) SWOT analysis
- (x) Profitability Analysis.

UNIT X: Business Valuation (10 Questions)

- (i) Meaning of Value, Valuation and Business Valuation
- (ii) Valuation Methods - Non Discounted cash flow method- Discounted Cash Flow Method - Free Cashflow Method, Net Present Value Method (NPV)- Profitability Index Method(PI) - Internal Rate of Return Method (IRR)
- (iii) Valuation of Inventory
- (iv) Valuation of Investments
- (v) Valuation of Intangibles
- (vi) Valuation of Human Resources
- (vii) Valuation of Equity

**16. Hindu Religion and Law
(Degree Standard)****Code: 488****Unit I: (20 Questions)**

Hindu Religion – Definition – Origin and Development of Hinduism – Vedas – Agamas - Upanishads – Smirits and Sruthis – Panniru Thirumuraigal – 4000 Divya Prabhandams

Unit II: (20 Questions)

Saivism - Vaishnavism - Saktham - Kaumaram - Ganapathyam - Sauram - Jainism - Alwars - Nayanmars - Sankarar - Ramanujar – Madhwachariar - Thayumanavar - Vallalar – Arunagirinathar

Unit III: (20 Questions)

Hindu Culture – Temple Architecture and Sculpture – Inscriptions – Temple Icon, Idols, Murals, Manuscripts, Copper plates and monuments – Temple Festivals – Rituals and consecration

Unit IV: Hindu Religious and Charitable Endowments Act, 1959 (20 Questions)

History of the Act - Short title, Extent and Commencement – Power to extend Act to Jain Institutions and Endowments – Exemptions – Definitions – Advisory Committee – District Committee – Commissioner and other controlling authorities and their powers – Delegation of Powers – Powers to enter Religious Institutions - Trustees - Qualification and disqualification of Trustees – Power to suspend dismiss or remove trustees - Hereditary Trustees – Framing of Scheme

Unit V: Hindu Religious and Charitable Endowments Act, 1959 (20 Questions)

Preparation of Registers – Property and Thittam – Alienation of immovable trust property – Utilization of surplus funds – Common good fund – Religious and Charitable Endowments Administration fund – Encroachments - Procedure and mode of eviction -Penalty and Recovery – Appeal
Duties and Powers of Executive Officers – Custody of Jewels and Valuables – Appointment of Office holders and servants in Religious Institutions – Punishment of Office holders and servants – Budget of Religious Institutions – Accounts and Audit Report and Rectification

Unit VI: Jurisprudence (20 Questions)

Jurisprudence - Nature, Functions and Evolution - Sources - Kinds of Law - Schools of Jurisprudence - Theoretical perspectives and influence on Indian Jurisprudence– Social Transformation and Justice - Legal Realism & Indian Judiciary - Civil & Common Law - Concept of State - Laissez-faire to Social Welfare State - Transformation in Contemporary Era.

Unit VII: Constitution, Administrative and Human Rights Law (20 Questions)

Constitution – Definition, Nature and Salient features of the Indian Constitution – Preamble - State - Fundamental Rights – Directive Principles of State Policy and its enforceability - Fundamental Duties - Administrative Law – Definition, Nature and Scope– Rule of Law - Doctrine of Checks and Balances - Delegated Legislation - Judicial Review of Administrative action and Discretion - Writs - Right to Information – Concept, Procedures and Institutions - UN Charter and Human Rights Institutions- Role of Judiciary and Human Rights - Protection of Human Rights Act 1993 - National and State Human Rights Commissions.

Unit VIII: Contract Law & Transfer of Property (20 Questions)

Law of Contract - Essentials of Contracts – Valid, Void, Voidable - Discharge of Contracts – Quasi Contracts -Damages – Compensation
Transfer of Property – Kinds of Property - Possession and Ownership – Defining Transfer – Transfer to unborn person – Vested and Contingent Interests – Ostensible Ownership – Lis pendens – Charge - Sale, Mortgage, Lease, Gift, Exchange

Unit IX: Personal, Heritage and Archaeology Laws (20 Questions)

Hindu Law- Sources – Marriage, Adoption and Succession - Tamil Nadu Temple Entry Authorization Act, 1947 -The Ancient Monuments and Archaeological Sites and Remains Act, 1958 -The Madras Ancient and Historical Monument and Archaeological Sites and Remains Act, 1971 -The Antiquities and Art Treasures Act, 1972 and Rules - The Tamil Nadu Heritage Commission Act, 2012 -United Nations - Heritage Sites and Monuments.

Unit X: Land Laws and Civil Procedure (20 Questions)

LAND LAWS – TN Land Encroachment Act, 1905 - Inam Abolition Act, 1963 and Estates Abolition Act, 1948 -The Tamil Nadu Town and Country Planning Act, 1971 - The Tamil Nadu Regulation of Rights and Responsibilities of Landlords and Tenants Act, 2017.

Land Acquisition Laws: The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 – Tamil Nadu Highways Act, 2001 – Tamil Nadu Acquisition of Land for Industrial Purposes Act,

1997 – Tamil Nadu Acquisition of Land for Harijan welfare Schemes Act, 1978

Suits in General – Jurisdiction - Plaint, Written Statement – Admission – Process of Appearance – Decree and Judgement - Execution – Reference, Review, Revision – Appeal in Civil Cases –The Contempt of Courts Act.

17. Human Resource Management (PG Degree Standard)

Code: 572

Unit I: Introduction of Human Resource Management (20 Questions)

Definition of Human Resource Management (HRM) – Objectives of HRM – Nature of HRM – Scope and Importance of HRM – HRM vs. Personnel management - Functions of HRM – Managerial Functions – Operative Functions – Qualities of HR Manager – Roles and Responsibilities of HR Manager – Challenges of HR Managers - Structure of HR Department – Personnel Policies and principles

Unit II: Perspectives of Human Resource Management (10 Questions)

Approaches of Human Resource Management – Evolution of Human Resource Management - Theories of Human Resource Management – Human Capital Management – HR Models – HR Management competencies and careers – Strategic Role for Human Resource – Strategic Human Resource Management – Benefits of SHRM

Unit III: Human Resource Planning (20 Questions)

Meaning and Objectives of Human resource planning - Importance of Human Resource Planning – Process of Human resource planning - Forecasting Human Resource Requirement – HR Demand and Supply – Factors affecting HRP –Job Analysis – Methods of collecting Job Data - Job Design - Job Description – Job specification – Barriers to Human Resource Planning

Unit IV: Recruitment and Selection (20 Questions)

Purpose and importance of Recruitment - Factors of Recruitment – Process of Recruitment – Sources of Recruitment - External and Internal – Employee Referrals – Nature of Selection – Objectives of Selection – Factors affecting selection - Selection Process – Types of Selection Tests – Interviews –Types of Selection Interviews - Barriers in Selection – Evaluation of Selection Process

Unit V: Training and Development (25 Questions)

Orientation – Purpose of orientation – Induction - Definition of Training – Scope and need of Training – Benefits of Training - Methods of Training – On-the-Job – Off-the-Job - Assessment of Training needs – Process of Training – Purposes of training – Evaluation of Training - Meaning of Development – Objectives of Development – Management Development – Management Development Programmes - Career Development process – Challenges of Career Development – Talent Management.

Unit VI: Performance Management (20 Questions)

Overview of Performance Management System – Performance Appraisal: Meaning, Objectives, Scope, Importance – Job evaluation vs. Performance Appraisal - Uses of Performance Appraisals - Different Methods of Performance Appraisals – Traditional methods – Modern Methods – Limitations in Performance appraisal - Problems in Performance Appraisal - Potential Appraisal – Assessment Centres – Balanced Scorecard - HR Scorecard – Benchmarking – Applications of Performance Management

Unit VII: Compensation Management (20 questions)

Meaning of compensation management – Objectives – Principles – Factors influencing compensation management – Significance of compensation - Compensation Plans - Components of compensation – Fringe Benefits – Perquisites – Wage and Salary – Rewards & Incentives – Non-monetary benefits – Theories of Compensation – Job evaluation – Methods of job evaluation - Motivation – Factors of Motivation - Motivation Theories

Unit VIII: Industrial Relation Management (25 questions)

Meaning, Importance, Objectives & Concept of Industrial Relation – Nature of Industrial relations – Stakeholders of Industrial relations – Trade unions – Measures to strengthen Trade unions - Problems of Trade Unions – Industrial disputes – Types of Industrial disputes - Causes of Industrial disputes – Grievance redressal mechanism – Collective bargaining – Workers Participation in management – Labour Legislation in India

Unit IX: Organisational Culture and Ethics (25 questions)

Nature of Culture – Organisation Vision, Mission, Values & Strategies - Cultural Dimensions - Workplace Environment - Workplace culture - Workplace diversity – Factors affecting Workplace culture – Culture-Strategy fit – Change Management – Conflicts in Organisation - Work-life balance – Workplace ethics – Ethical Dilemmas – Ethical issues in HRM – Managing Ethics - Discipline and Code of Ethics – Corporate culture and Ethical climate

Unit X: New Frontiers in Human Resource Management (15 questions)

Computer Application in HRM - Human Resource Information System – HRIS Framework - Human Resource Analytics – Objectives of HR Analytics – Key elements in HR analytics - HR metrics – Stages of HR Analytics – HR Analytics in practice – HR Delivery model - Knowledge Management – Technology and Knowledge management – Role of HR Professional – Challenges in Implementing HR Practices

18. Industrial Safety and Health (Degree Standard)

Code: 515

UNIT I: Chemical Technology, Chemical Process Calculations, Thermodynamics, Fluid Mechanics and Mechanical Operations (20 questions)

Fertilizers, Cement, Glass, Ceramic and Refractories, Oils, Soaps and Detergents, Pulp and paper, Dyes, sugar, leather and rubber, polymer, pharmaceutical and food industries.

Properties of gases, liquids and solids, Humidity and saturation, Gas laws, Material balance involving recycle, by-pass and purge systems with and without chemical reactions and Energy balances. Material and Energy balance with reactions, Gibbs Phase rule.

Thermodynamics and its applications, thermodynamic functions, compressibility factors, entropy, Chemical Reaction Equilibrium.

Fluid Statics, Newtonian and Non-Newtonian fluids, Equation of continuity, Navier Stroke equation, Friction Factor, Dimensional analysis, Flow through pipes, flow through fixed and fluidized beds, flow meters.

Laws of size Reduction, Mixing and agitation, Filtration, Sedimentation and Conveying of solids. Materials of construction for chemical Industries - Polymeric and composite materials, Nano and biomaterials. Corrosion - prevention and control.

UNIT II: Heat Transfer, Mass Transfer, Chemical Reaction Engineering and Process Design, Instrumentation and Control (20 questions)

Modes of Heat transfer, Heat transfer with phase change, heat transfer coefficient. Design of heat exchangers - Double pipe, Shell and Tube. Evaporators - Single and Multiple effect.

Fick's Laws, Diffusion, Mass Transfer Coefficient and theories of Mass Transfer, Momentum, Heat and Mass transfer analogies, Inter phase Mass transfer operations, HTU, NTU and HETP concepts, Design of equipment - Distillation, Extraction, Absorption, Drying. Crystallization and Membrane separation processes.

Reaction rates - homogeneous and heterogeneous reactions, single and multiple reactions in ideal reactors. Residence time distribution. Design of reactors - Isothermal and non-isothermal fixed bed reactors and fluidized bed reactors. Kinetics of heterogeneous catalytic reactions. Diffusion effects in catalysis- rate and performance equations, Catalyst deactivation.

Numerical solutions of linear and non-linear algebraic equations, solution of initial and boundary values, Integration of Simpson rule. Solution of partial differential equations. Eigen value problems - Theorem for Eigen values and Eigen functions.

Sensitivity analysis, Constrained and unconstrained NLP, Newton's method, Quasi-Newton's method, Cost estimation, Plant utilities, pinch technology, Laplace transformation, application to solve ODEs. Open-loop systems, first order systems, first order systems in series, second order systems and their dynamics; transportation lag. Closed loop control systems, feed-back control systems, BODE diagram, stability criterion, frequency response.

UNIT III: Environmental Engineering, Occupational Safety and Health in Chemical Industry, Mechanics of Machinery, and Management in Textile Industry (20 questions)

Air, Water, Soil pollution and Noise control. Wastewater treatment by various methods: Chemical, biochemical and advanced oxidation process. Industrial hygiene, occupational safety & health in chemical industries, Industrial safety principles, plant layout, chemical hazards identification and classification, Safety in operations and processes, fire safety, hazard identification techniques, disposal of hazardous and toxic wastes, onsite and offsite emergency preparedness plan, safety audit, work permit system, roles and responsibilities of safety officers and welfare officers, occupational diseases.

Kohlberg's theory – Gilligan's theory - Safety and Risk – Assessment, Risk Benefit Analysis and Reducing Risk, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Professional Rights, Employee Rights. Intellectual Property Rights (IPR).

Drive transmission, clutches and brakes in textile machinery, design of machine elements – cams, cone drums, drafting rollers; calculations – sley eccentricity, beat-up force; application of industrial engineering in garment industry; costing of yarn, fabric and garment; maintenance of light, temperature and humidity, and ergonomic aspects in textile industry, interpretation of financial statements; investment appraisal techniques; application of TQM tools.

Unit IV: Textile Manufacturing (20 questions)

Classification and identification of fibres; structure and properties of fibres; Production of synthetic fibres – raw materials, wet, dry, melt, dry-jet spinning.

Objectives, principle of working and calculations – ginning, blow room, carding, draw frame, comber preparatory, comber, roving frame, ring frame, ring doubling, TFO, rotor, air-jet, air-vortex, friction, core and wrap spinning machines; helical geometry and packing density of yarn, yarn contraction, yarn twist vs. strength, structure-property relations of yarns.

Objectives, principle of working and calculations – winding, warping, sizing; principle of fabric formation in shuttle looms, rapier, air-jet, and projectile looms; Basic woven fabric structures and its derivatives; Pierce geometry of plain woven fabrics, structure-property relationship of fabrics.

Objectives, principle of working and calculations – circular, flat and warp knitting; basic weft and warp knitted structures; production of nonwovens – needle punch, spun lace, spun bond and melt blown.

Safety measures in fibre, yarn and fabric manufacturing industry.

Unit V: Chemical Processing of Textiles and Quality Assurance (20 questions)

Objectives and principles of desizing, singeing, scouring, bleaching and mercerizing machines; dyeing of different types of fibres, yarns and fabrics and the machines used; types and methods of printing; colour and fastness measurement.

Principles and methods for shrink-proof, raising and calendaring, crease resistance, water-proof, water-repellent, flame retardant, soil release, UV resistance, anti-microbial, anti-static, softening, stiffening, elastomeric, self-cleaning finishes; eco-friendly processing, eco standards and eco labels, characteristics of effluent and effluent treatment.

Measurement of length, strength, fineness, maturity and trash of the cotton fibres; measurement of count, twist, strength and elongation, unevenness, imperfections and hairiness of the yarn; determination of construction parameters, tensile, tear, and bursting strength, air permeability, bending, drape, crease and wrinkle recovery, thickness, pilling and abrasion resistance and shrinkage of the fabrics; yarn defects analysis – diagram, spectrogram, Variance-length curve; fabric defects analysis.

Garment manufacturing – pattern making, marker planning, spreading, cutting, sewing and finishing; types of stitches and seams; garment inspection; fibre, yarn and fabric requirement for industrial, automotive, geo, agro, medical, protective and sports textiles.

Safety measures in chemical processing industry.

UNIT VI: Electrical Engineering (20 questions)

Circuit elements – Kirchoff's Laws – Mesh and Nodal Analysis – Network Theorems and Applications for DC and AC circuits: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem. Three phase Circuits, Star – delta transformation.

Coulomb's Law, Gauss's Law, Magnetic Circuits – Magnetomotive force- Reluctance – Faraday's laws – Lenz's law – Biot – Savart's law – Ampere's law – Fleming's left and Right Hand Rule -Lorentz force – Inductance – Self and Mutual Inductance – Dot Convention – Coupled Circuits.

D.C, Machines, Generators and Motors – Starting, Speed Control and braking – Testing Losses and Efficiency. Transformers – Types – Construction and Operation – Testing. Induction Machines Starting, Speed Control and braking Synchronous Machines, permanent magnet brushless DC motor, stepper motors

Circuit Breakers- protection; transformer, generator, motor, bus bars and transmission line – AC and DC Distribution – deregulation- energy conservation and energy auditing.

UNIT VII: Measurements, Control Systems and Power Electronics (20 questions)

Measurement of Current, Voltage, Power, Power factor; Energy –Indicating instruments – Multi meters, Transducers and their applications to the Measurement of Non-Electrical Quantities like Temperature, Pressure, Flow-rate, Displacement, Acceleration, Noise level- Data Acquisition Systems – A/D and D/A converters – Data Transmission Systems – PLC – smart meters.

Control systems; Mathematical Modelling of Physical Systems, Transfer function, block diagram, signal flow graph and the reduction, PI, PD and PID Controllers –state. Semiconductor Devices

Power Semiconductor devices – single and Three Phase AC to DC Converters, Speed Control of DC Drives speed control of AC drives, induction motor drives.

Unit VIII: Electrical Power Generation and Thermal Engineering (20 questions)

Power Generation Types – Hydro, Thermal and Nuclear Stations, Co-generation, Renewable Energy, Solar energy, Wind Energy, smart grid – electric vehicles – V2G and G2V – Fuel cells – Batteries – types and characteristics – Super Capacitors.

Thermal engineering - basic concepts, Zeroth, First and Second laws of thermodynamics, thermodynamic system and processes, Emissions and Controls. I.C. Engines Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration. Heat exchanger performance.

UNIT IX: Mechanical Engineering (20 questions)

Properties of Surfaces and Solids, Centre of Gravity, Gears and Gear Trains, Fly Wheels and Governors, Balancing of Rotating and Reciprocating Masses, Friction in Machine Elements, Force Analysis, mechanisms for Vibration Control. Stress, Strain and Deformation of Solids, Fundamentals of Design for Strength and Stiffness of Machine Members, Spur Gears and Parallel Axis Helical Gears, Bevel Gears, Worm Gears and Crossed Helical Gears. Fluid properties, Bernoulli's equation, Pelton wheel, Francis and Kaplan turbines - pumps and its applications -Valves and Types

Production Flow Analysis, Industrial Robotics, lean manufacturing. Work study - Techniques, Method study - ABC Analysis material handling systems, Management theory and practice, planning - Decision making, Organising, staffing, Motivation, Leadership, controlling, control techniques, Industrial Safety - Standards – OSHA.

UNIT X: Production Engineering (20 questions)

Constitution of alloys and phase diagrams, heat treatment of ferrous and non-ferrous metal, surface modification techniques, powder metallurgy, non-metallic materials, mechanical properties and testing, crystal defects and strengthening mechanisms, Engineering ceramics, Engineering and commodity polymers, composites, nano-materials. Foundry Technology- Sheet Metal Operation welding defects, Casting, Welding Inspection (NDT), Machinability machine tools - CNC machine tools. Limits, Fits and Tolerance, Computer Aided Inspection, Machine vision, Measurement of power, flow and temperature. Statistical quality control, control charts, acceptance sampling, reliability, TQM, 5S, ISO standards. Fundamentals of Computer Graphics, Geometric Modeling, Production Planning and Control, Computer Aided Process Planning, Cellular Manufacturing, Flexible Manufacturing System and Automated Guided Vehicle System.

19. Library and Information Science (Degree Standard)

Code: 266

Unit I: Library and Society (22 Questions)

- (i) Library as a Social Institution; Impact of Libraries on Social, Political, Economical, and Cultural aspects, Laws of Library Science.
- (ii) Types of Libraries – Public, Academic and Special Libraries; Library movement in India;

- (iii) Library Legislation; Public Library Act; Delivery of Books and News papers (Public Library) Act; Intellectual Property Rights – Copyright Act
- (iv) Library associations and Professional bodies - UNESCO, IFLA, ALA; CILIP; ILA; IATLIS
- (v) Role of government agencies in library development – RRRLF; UGC - INFLIBNET

Unit II: Library Management (20 Questions)

- (i) Management – Concept; Definition; School of Thoughts – Functions of Management; (POSDCORB); Library Authority and Committee.
- (ii) Library Sections and Routines – Acquisition, Technical, Maintenance, Circulation, Reference and Periodical.
- (iii) Human Resource Management – Job Analysis, Job Description, Recruitment, Selection, Training, performance Appraisal, training, motivation, etc.
- (iv) Financial Management – Budget – Types, Sources of income to various types of libraries, Physical facilities – Building and Furniture.
- (v) Library Records - Statistics; Reports

Unit III: Information Processing (Library Classification) (18 Questions)

- (i) Library Classification – Concept; Definition; Need and Purpose
- (ii) Library Classification – Types: General and Special; Various Schemes of classification – Colon Classification; Dewey Decimal Classification; Universal Decimal Classification and Library of Congress Classification.
- (iii) Structure of knowledge – Modes of Formation of Subject, - Canons and Laws
- (iv) Facet and Facet analysis – Fundamental categories (PMEST); Analytico- Synthetic approach and Devices.
- (v) Notation –Types; Characteristics

Unit IV: Information Processing (Library Cataloguing) (24 Questions)

- (i) Library Cataloguing – Concept; Definition; Need, Purpose and Functions.
- (ii) Library Catalogue – Types – Physical forms and Inner forms - Alphabetical, Classified, and Alphabetico - Classified; Trade catalogue;
- (iii) Cataloguing Standards – ISBDs; Cataloguing Codes – Classified Catalogue Code of Ranganathan, Anglo-American Cataloguing Rules
- (iv) International Standards – MARC – CCF; UNIMARC; MARC21; Metadata
- (v) Subject Headings – Sears' List of Subject Headings, LCSH, Centralised and Co-Operative Cataloguing.

Unit V: Information Sources (22 Questions)

- (i) Information Sources – Types – primary, secondary, and tertiary; Print Vs. Electronic resources; Human Vs. Institutional
- (ii) Evaluation of Information Sources – Criteria
- (iii) Secondary Sources: Dictionaries, Encyclopedias, Indexing and Abstracting Sources, Directories, Biographical Sources; Geographical Sources
- (iv) Electronic Information Sources - Databases; Full-text data bases
- (v) Information Sources – Discipline – oriented sources – Pubmed; INSPEC; etc; UGC - e-Sodhsindhu Open sources

Unit VI: Information Services (18 Questions)

- (i) Information Services - Types: Ready reference and Long range reference services; User education; Information literacy
- (ii) Literature search – Bibliography compilation and Bibliographical services
- (iii) Current Awareness Service, SDI
- (iv) Indexing and Abstracting services; Referral Service.
- (v) Reprography, Translation and other specialized services

Unit VII: Computer and Computer Applications (20 Questions)

- (i) Computer – Definition; Characteristics; Classification of Computers Hardware – Generations; Input and Output Devices; Secondary Storage Devices; Tele communication – Concept and Components.
- (ii) Computer Software – Meaning; Types – System Software and Application Software; Operating System – Single user vs. Multi-user; Open Sources vs Proprietary
- (iii) Database – Concept; Database Management System (DBMS) – Concepts; Functions;
- (iv) Library Automation - Need and Purpose; Areas of library automation; Library automation software packages – Proprietary vs. Open.
- (v) Web Technology – Browser, Search Engine, Protocol, ISDN.

Unit VIII: Resource Sharing and Networking (20 Questions)

- (i) Resource sharing – Concept, Definition, Need, Purpose.
- (ii) Library Co-operation – Concept, Definition, Need and Purpose.
- (iii) Computer Networks – Types – LAN, WAN, MAN; Internet and Intranet
- (iv) Library Networks – Concept, Need, Functions.
- (v) Library Network System – International, OCLC World cat; National – INFLIBNET, DELNET.

Unit IX: Information System (20 Questions)

- (i) Information System – Concept, Characteristics and Functions.
- (ii) Information System, Types – International, National; Subject – Mission Oriented; National Knowledge Commission; National Mission on Libraries.
- (iii) Information Systems – International UNESCO, INIS, AGRIS, INSPEC, PUBMED, CAS; National – NISCAIR, DESIDOC.
- (iv) Library Consortia – Trends, Functions; UGC – e-sodhsindhu, N-LIST, CSIR Consortium.
- (v) Open Access movement; Open Access System.

Unit X: Digital Library (16 Questions)

- (i) Digital Library – Concept, Definitions, Characteristics, Theoretical framework, Merits and Demerits.
- (ii) Digital Library Management – Design, Architecture, Standards.
- (iii) Digital Library Initiatives – Initiatives in India; Open Archives Initiatives.
- (iv) Metadata – Definition, Standards, Metadata Harvesting.
- (v) Digital Library – Building process – Digitization; Software and Hardware; Institutional repositories.

20. Mechanical, Production and Manufacturing Engineering (Degree Standard)

Code: 399

Unit I: Mechanics, Kinetics and Dynamics (18 Questions)

Statics of Particles, Equilibrium of Rigid bodies, Mechanism of Deformable Bodies, Properties of Surfaces and Solids, Centroid, Centre of Gravity, Dynamics of Particles, Elements of Rigid Body Dynamics, Basics of Mechanisms, Kinematics of mechanisms, gyroscope, Gears and Gear Trains, Fly Wheels and Governors, Balancing of Rotating and Reciprocating Masses, Friction in Machine Elements, Force Analysis, Balancing, Single Degree Free Vibration, Forced Vibration, mechanisms for Vibration Control, Effect of Damping, Vibration Isolation, Resonance, Critical Speed of Shaft.

Unit II: Strength of Materials and Design (20 Questions)

Stress, Strain and Deformation of Solids, Combined Stresses, Theories of Failures, Transverse Loading on Beams, Stresses in Beams, Torsion, Deflection of Beams, Energy Principles, Thin Cylinders and Thick Cylinders, Spherical Shells, Fundamentals of Design for Strength and Stiffness of Machine Members, Design of Shafts and Couplings, Design for Static and Dynamic Loading, Design of Fasteners and Welded Joints, Reverted Joints, Design of Springs, Design of Bearings, Design of Flywheels, Design of Transmission Systems for Flexible Elements, Spur Gears and Parallel Axis Helical Gears, Bevel Gears, Worm Gears and Crossed Helical Gears, Design of single and two stage speed reducers, Design of cam, Clutches and Brakes, Design of Piston and Connecting Rods.

Unit III: Fluid Mechanics and Turbo Machinery (20 Questions)

Fluid properties, fluid statics, manometry, buoyancy, control volume analysis of mass, momentum and energy, fluid acceleration, differential equations of continuity and momentum, Bernoulli's equation, Dimensional Analysis, viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends. Turbomachinery: Pelton wheel, Francis and Kaplan turbines - impulse and reaction principles – velocity diagrams, pumps and its applications-Valves and Types - Theory of Jet Propulsion- Pulse Jet – Ram Jet Engines, Online Continuous Flow Monitoring System.

Unit IV: Thermal Engineering and Thermodynamics (30 Questions)

Basic concepts, Zeroth, First and Second laws of thermodynamics, thermodynamic system and processes, Carnot cycle. irreversibility and availability, behaviour of ideal and real gases, thermodynamic relations, properties of pure substances, calculation of work and heat in ideal processes, analysis of thermodynamic cycles related to energy conversion, Fuel and combustion, Fuels Characteristics, Emissions and Controls, Testing of IC Engine-Renewable sources of Energy.

Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychometric chart, basic psychometric processes.

Unit V: Heat and mass Transfer (25 Questions)

Modes of heat transfer - one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes, thermal boundary layer, effect of turbulence, radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

Basic Concepts of Mass transfer, Diffusion Mass Transfer, Fick's Law of Diffusion Steady state Molecular diffusion, Convective Mass Transfer, Momentum, Heat and Mass Transfer Analogy, Convective Mass Transfer Correlations, Radiative Heat Transfer.

Unit VI: Materials Science and Metallurgy (25 Questions)

Constitution of alloys and phase diagrams, Iron – Iron Carbide Phase Diagram - steels, cast iron, phase transformations - diffusion - TTT diagram, ferrous and nonferrous alloys, heat treatment of ferrous and non-ferrous metal, surface modification techniques, powder metallurgy, non-metallic materials, mechanical properties and testing, crystal defects and strengthening mechanisms, conducting and semi conducting materials, magnetic and dielectric materials, Engineering ceramics, Engineering and commodity polymers, composites, nano-materials.

Unit VII: Production Technology (22 Questions)

Foundry Technology - types of pattern, cores, moulding and casting methods, Solidification, design of castings, defects, Melting Furnaces, Hot and Cold working, Metal Forming Processes - types, Defects and Remedies, Sheet Metal Operation, metal joining processes, types and design of weldment, welding metallurgy, welding defects, Casting, Welding Inspection (NDT), Manufacturing of Thermo Setting and Thermo Plastic Products, Metal cutting, Cutting Tool Nomenclature, Machinability machine tools - center lathe, drilling, milling, grinding, gear cutting and broaching, Machining Time Calculation, unconventional machining processes, Micro Manufacturing, CNC machine tools, Manual Part Programming - Machining and Turning Centre.

Unit VIII: Metrology and Quality Control (15 Questions)

Limits, Fits and Tolerance, Linear and angular measurements, Interferometry, laser interferometers - Types, Computer Aided Inspection, Basic concept of CMM - Types of CMM, Machine vision, Form measurement-Straightness- Flatness, Roundness, Surface finish measurement, contact and non-contact method, Measurement of power, flow and temperature. Statistical quality control, control charts, acceptance sampling, reliability, TQM, 5S, ISO standards.

Unit IX: CAD / CAM / CIM / FEA (13 Questions)

Fundamentals of Computer Graphics, Geometric Modeling, Visual Realism, Assembly of Parts, CAD Standards, Fundamentals of CIM, Production Planning and Control, Computer Aided Process Planning, Cellular Manufacturing, Flexible Manufacturing System and Automated Guided Vehicle System, Group Technology, Production Flow Analysis, Industrial Robotics, Additive Manufacturing, Just in Time(JIT), lean manufacturing, One Dimensional Problems in FEA, Two Dimensional Scalar Variable Problems, Two dimensional vector variable problems, Isometric Parametric Formulation.

Unit X: Industrial Engineering and Management (12 Questions)

Work study - Techniques, Method study and work measurements - objectives - basic procedure, machine loading and scheduling, product sequencing, inventory control - E O Q - quantity discounts, ABC Analysis material handling systems, operations research, Linear Programming, simplex method, Transportation model, Assignment model CPM and PERT, Queuing Models. Management theory and practice, planning - Decision making, Organising, staffing, Motivation, Leadership, controlling, control techniques, Industrial Safety - Standards – OSHA.

21. Mining Engineering (Degree Standard)

Code: 347

Unit I: Geology, Mine Development, Drilling and Blasting (30 Questions)

Geology: Earth structure & Composition, weathering, ground water, Geological time scale, types of rocks and their modes of occurrence, mineral resources, their distribution in different types of rocks of different ages, classification and properties of minerals, Geological structures like folds, faults, etc., their classification and their significance in the mineral exploration & mapping, ore reserve estimation including their shape. Different Ore forming processes, origin & modes of occurrence, classification of mineral deposits, fossil fuels like coal, petroleum etc., Mineral distribution in India. Various exploration and prospecting methods including geophysical prospecting, their fields of application & limitations. Introduction to aerial and photography, remote sensing & GIS for mapping and exploration.

Role of Mining Industry in National Economy, Role of Mining Engineers in Mining Industry, Challenges faced by Mining Industry, Indian and World Mineral Resources, Types of Drilling; exploratory & production drilling; core recovery, core logging & interpretation of bore hole data, machines for opencast and underground mines, selection & limitations, parameters influencing drilling. Directional drilling, mechanics of different types of drilling,. Exploratory & production drilling, types of drilling and Explosives and accessories, properties, classification; Selection; Storage, transport and handling and use of explosives, different types of initiation systems, mechanics of blasting, drilling & blast design for opencast and underground mines (including solid blasting), secondary blasting, misfires, vertical crater retreat blasting, adverse impacts of blasting and their control, instrumentation, testing of explosives, fragmentation studies, controlled blasting, alternatives to blasting. Different modes of entry into underground mines, their location and design. Different methods of shaft sinking including special methods-various activities, modern & mechanized techniques of shaft sinking, shaft raising, shaft boring, widening and deepening of operating shafts. Drivage of drifts and tunnels covering all associated activities including continuous and tunnel boring techniques.

Unit II: Mine Environment (20 Questions)

Mine gasses – occurrence, properties, detection, physiological effects and permissible limits, Mine climate and control, Heat and humidity, Natural Ventilation, Distribution of air current in mines, Resistance of mine roadways, Mine fans and their characteristics, testing, use of multiple fans. Ventilation and illumination survey, Ventilation planning in mines. Mine illumination, methane drainage Flame safety lamps, ventilation devices, Types of ventilation, auxiliary ventilation including overlap ventilation.

Ventilation network analysis and numerical problems, Pollution due to mining - Noise, air, water and land pollution, Ground vibrations, monitoring and control, Pollution standards and remedial measures,

Spontaneous heating, Mine fires, Explosions – causes, prevention and control, Firefighting, reopening of sealed-off areas, Inundation – causes, prevention and control, Design of water Dams, Mine rescue and recovery, investigation after an explosion, rescue organization of a mining company, Air conditioning and air cooling, Rescue and First aid in mines.

Concept of environment and ecology, Landscape planning and analysis, Biosphere, Hydrosphere, Atmosphere, Nutrient cycling, Effect of industrialization in atmosphere, Air quality sampling and modeling, Impact of pollution on human health. Reclamation of mined out land, Tailings management and subsidence, Environmental impact assessment, Environmental management plans, Environmental audit, Environmental clearance for mining projects, Environmental legislations, Safety and environmental protection.

Unit III: Mining Machinery (5 Questions)

Different types of motive power used in mines, Rope haulages, Wire ropes, safety devices, different types of locomotives, safety devices, free steered vehicles; Hydraulic, pneumatic and gravity transport, Mine pumps, different types, characteristics and fields of application, design of pumping systems, Rope haulage, locomotives and pumping calculations. Distribution of electrical power in mines, Electrical layouts, Mine cables, Flame-proof and intrinsically safe apparatus, Mine communication, man riding systems, different types of pumps, their characteristics and fields of applications.

Winding systems, Friction and drum winders, Multi-rope winding, safety devices, Winding accessories – winding engines, headgear, head sheave, skips, suspension gear, shaft fittings etc., duty cycles and winding calculations. Surface and pit-bottom arrangements, Coal face machinery including longwall equipment, Different types of conveyors and their construction, design and calculations, High angle conveying, Hydraulic & Pneumatic transport, Aerial ropeways, Design and construction of silos and bunkers, Stacking and blending, Condition monitoring of mining machinery.

Unit IV: Surface Mining (30 Questions)

Suitability of surface mining and limitations, Cut-off grades, Pit limits, Stripping ratios, Design of pit slope, haul roads, benches box cuts, Opencast mine development - different methods, Earth moving machinery - shovels, draglines, continuous surface miners, bucket wheel excavators, dumpers, rippers, scrapers, rock breakers etc., Productivity and maintenance of Heavy Earth Moving Machinery. Types of slope failures, Slope stability analysis and stabilization including dumps, In-pit-crushing and conveying, Continuous surface mining. Placer mining and solution mining, conversion of underground mines to opencast mines and vice-versa. Truck dispatcher systems, Machine availability, productive and maintenance scheduling, output, manpower and calendar planning.

Unit V: Underground Mining (Coal & Metal) (5 Questions)

Coal Mining: Importance of coal as a source of energy, current status of coal mining world over, grading of coal, Choice of mining methods and classification, Bord and pillar method - design of panels, pillar extraction by caving and stowing, partial extraction, supports, Longwall method - advance and retreat, mechanized longwall, latest trends, Design of longwall workings, salvaging and relocation of equipment, punched longwall. Thin and Thick seam mining, problems, multi-slices and special methods like gallery blasting, sub-level caving, horizon mining, contiguous, hydraulic mining, underground coal gasification, shield mining of steep seams, shaft pillar extraction, introduction to coal- bed methane.

Metal Mining: Classification of mining methods, Metal mining layouts, Methods of development -shafts, raises, winzes, drifts, bins, tunnels etc., Stope preparation, Stopping methods – supported and unsupported, their selection - longwall, room and pillar, shrinkage, sub-level, cut and fill, block caving and combined, backfilling, etc., Techno- economic analysis of mining systems, Extraction of remnant pillars, shaft pillars, Mining at great depths.

Unit VI: Rock Mechanics & Ground Control (10 Questions)

Stress analysis, Numerical problems, Application of rock mechanics in mining, Physico- mechanical properties of rocks and rock indices, elastic constants - laboratory and in situ testing, Rock mass classification, Post-failure behaviour of rocks, Dynamic wave velocities and elastic constants, Time dependent properties of rocks, Non-Destructive testing, Rheological modeling, Theories of failure of rocks,

Rock mechanics and ground control instrumentation, in situ stress measurement.

Roof examination, Different types of mine supports including FER supports, powered supports, etc. Design and selection of mine supports, Systematic supports, different methods of stowing, underground and face arrangements, Design of underground workings and stress distribution for Bord and pillar, Longwall workings, etc., Design of pillars; subsidence, measurement, prediction, control, remedial measures; Rock burst and bumps causes, prediction and control, etc.

Unit VII: Mine Surveying & Mineral Processing (20 Questions)

Principles of mine surveying, Underground surveying methods, methods of leveling, contouring, curve setting, traversing, Triangulation and Correlation, Errors and adjustments, Preparation of mine plans and sections, Numerical problems, Modern surveying techniques, Photogrammetry and remote sensing applications, EDM, Total station, GPS, GPR, GIS Astronomical survey, stope surveying, subsidence survey.

Scope and objectives of mineral processing, Choice of methods, Sequence of operations, Comminution, crushing and grinding - Theories, types of crushers and their fields of application, power consumption for crushing and grinding, Laboratory and industrial sizing, wet and dry screening, laws of particle settlement. Different concentration techniques, jigging, tabling, flotation, wet and dry screenings, magnetic separation, electro-static separation, optical sorter, Sampling and control, Coal beneficiation - Generalized plant design and flow charts for beneficiation of coal and other important ores.

Unit VIII: Mine Management & Computer Applications in Mining (30 Questions)

History and development of mine management, Principles of scientific management, Functions of management, Organization structure of a mine and a mining company, Time and work study, Industrial relations, Trade union and workers participation in management, Industrial psychology, Operations research - linear programming, transportation and assignment problems, CPM and PERT. SWOT analysis, supply chain management.

Microprocessors - Operating systems, Structured and object oriented programming, Networking Database management systems, Programming for mine design problems, CAD in mining for opencast and underground mines, Management information systems, ore-body modeling, Digitization and scanning, Artificial intelligence, Expert systems, Neural networks and virtual reality applications in mining, mining software. Computer applications in mine planning, ventilation network analysis, pillar design, blast design (opencast and underground), pumping systems, mine planning, etc.

Unit IX: Mine Legislation, Safety & Economics (30 Questions)

General provisions of Mines and Mineral Regulation and Development Act, Mineral Concession Rules, Mines Act, Regulations and Rules, Bye-Laws and DGMS Technical Circulars, Mines Vocational Training Rules, Land Acquisition, Explosives Act, Indian Electricity Rules, Workmen's Compensation Act, Rescue Rules, Mine accidents, classification and occupational diseases, accident statistics, Accident inquiry reports and cost of accidents, Mine disaster management, Safety audit and conferences. Environmental protection and conservation acts and rules, Miners diseases. Risk identification and Management.

Role of mineral industry in national economy, National mineral resources National mineral policy, Conservation of minerals, Royalty and taxation, Ore reserve estimation and geo-statistical methods, Mine valuation, Classification of reserves, net present value (NPV), Depreciation, Pricing and sale of minerals, Marketing and inventory, Costing, Wages and incentives, Book keeping, Balance sheet and profit and loss accounts, Numerical problems, Capital and revenue expenditure, DCF, profitability analysis, Economics of various mining operations, Assessment of cost of various mining operations, cost control methods.

Unit X: Mine Planning & Design (20 Questions)

Ore-body modelling, Opencast mine planning - mine cuts, surface structures, division of mining areas into blocks, Open pit optimization, Mine scheduling, Underground (coal and metal) mine planning, Location of mine entries, Optimization of mining parameters, Planning of production capacities, production planning and scheduling, productivity indices, Techno-economic analysis, Quality control and conservation, Planning and selection of equipment, Manpower and output planning, Preparation of mining projects - feasibility and detailed project reports, Sources of funding, Government policies., Mine Closure, Quality control.

22. Mining Engineering and Geology (Degree Standard)

Code: 573

Unit I: General Geology and Geomorphology (15 Questions)

Origin, Evolution, Age and Interior of the Earth - Principles of geodesy – Rock cycle – Isostasy - Continental drift, Seafloor spreading, Plate tectonics - Paleomagnetism and its application for determining paleoposition of continents – Orogeny and Epeirogeny – Volcanoes and earthquakes – Effects and causes – Seismic Hazard zonation of India - Tectonic deformation and seismicity in the Extra Peninsular, Indogangetic plains and Peninsular India - Applications of geomorphology in mineral prospecting and coastal studies - Weathering – processes and products - Geomorphic cycles and their interpretation - Morphology and its relation to structures and lithology - geomorphic landforms formed by action of rivers, wind, glaciers, waves and groundwater - Features of ocean floor - continental shelf, slope and rise - concepts of landscape evolution, major geomorphic features of India – coastal, peninsular and extra peninsular - Classification of shorelines and their evolution - submarine canyons, Geosynclines and Island arcs.

Unit II: Stratigraphy and Paleontology (20 Questions)

Principles of stratigraphy - Code of stratigraphic nomenclature of India - lithostratigraphy – biostratigraphy – chronostratigraphy – magnetostratigraphy, sequence stratigraphy - Principles of stratigraphic correlation; Indian stratigraphy and economic importance - Cratons of India – Dharwar, Bastar, Singhbhum, Aravalli and Bundelkhand Cratons - Proterozoic mobile belts – Eastern Ghats Mobile Belt, Southern Granulite Terrain, Central Indian Tectonic Zone, Aravalli – Delhi Belt, North Singhbhum Mobile Belt - Proterozoic sedimentary basins – Cuddapah, Delhi, Vindhyan, Kurnool and Kaladgi - Phanerozoic stratigraphy – Paleozoic - Spiti - Mesozoic - Spiti, Kutch, Narmada Valley and Trichinopoly - Gondwana Supergroup, Deccan Traps - Himalayas – Siwaliks - Fossil record and geological time scale - modes of preservation of fossils and concept of taphonomy – Body and ichno-fossils, Ediacara Fauna - Morphology and time range of Graptolites, Trilobites, Brachiopods, Lamellibranchs, Gastropods, Cephalopods, Echinoids and Corals - Evolutionary trends in Trilobites, Gastropods, Cephalopods; and Graptolites – Micropaleontology – methods of preparation of microfossils, morphology of microfossil groups (Foraminifera, Ostracoda).

Unit III: Structural Geology and Mineralogy (15 Questions)

Mechanical principles of rocks – Strain markers in deformed rocks - Mohr's circle – V rules and outcrop patterns – Stereographic Projections of structural elements - Mechanics and causes of folding and faulting - Classification of folds and faults - Recognition of folds and faults in the field - Joints – Cleavage and Schistosity types and origin – Secondary lineation - Types of unconformity and their recognition in the field – Definition, Classification and elements of minerals and Crystallography – Optical, Electrical and Magnetic Properties of minerals - Physical, chemical and optical properties of Quartz, Feldspars, Feldspathoids, Pyroxene, Amphibole, Olivine, Garnet, Mica, Zeolites and Carbonate groups – Concept of optical mineralogy – Identification of minerals using petrological microscope.

Unit IV: Petrology (25 Questions)

Classification of Igneous rocks: Mineralogical, Chemical and IUGS classification – Structures and textures - Petrography and petrogenesis of Granites, Alkaline rocks, Anorthosites, Carbonatites, Dolerites, Ultramafics - Bowen's reaction series - Diversity of Igneous rocks – variation diagrams - Crystallisation of Basaltic magma.

Sedimentary depositional environments – Important clastic and non-clastic rocks – Heavy minerals and Provenance – Tectonics and Sedimentation – Sedimentary Basins of India – Paleocurrents and Basin Analysis - Classification of sedimentary rocks - sedimentary textures grains size, roundness, sphericity, shape and fabric - grain size analysis - sediment transport and deposition - sedimentary structures - composition and significance of different types of sedimentary rocks Sandstone, Limestone, Banded Iron Formation, Mudstone and Conglomerate - carbonate diagenesis and dolomitisation.

Metamorphism – Agents and kinds of metamorphism – classification of metamorphic Rocks – Textures and Structures – Different grades and depth Zones – Metamorphic facies – Metamorphic differentiation – Thermal – Clastic and Regional Metamorphism – Origin of Eclogites – Charnockitisation – Granitisation – Metasomatism.

Unit V: Economic Geology and Hydrogeology (20 Questions)

Classification of mineral deposits – Process of formation of mineral deposits - Magmatic, Hydrothermal, Sedimentary, Metamorphic, Sublimation, Evaporation, Oxidation and Supergene enrichment - Metallogenic Epochs and provinces of India - Controls of ore Localisation – Origin, Occurrences, Indian distribution and uses of the following ores - Iron, Manganese, Copper, Lead, Zinc, Aluminium, Chromium, Gold, Barite, Graphite, Asbestos and Silica, Uranium, Thorium and Industrial Minerals. Origin of coal and petroleum - Physical and Chemical Properties of coal and petroleum – Deposits of coal and Petroleum in India – Distribution of Gondwana and Tertiary coal fields of India. Gas hydrates and Coal bed methane, Petroliferous basins of India – Strategic, Critical and essential minerals – National mineral policy 2019 – Conservation and Utilization of mineral resources.

Origin and Occurrence of groundwater – Vertical Distribution of Ground Water - Aquifers - Hydraulic conductivity and Hydrological parameters - Transmissibility, Permeability - Specific yield and retention - Hydrogeological characters of different types of rocks - Rock water interaction – Ground Water Quality and Pollution - Types of wells - Well logging methods - Pumping test methods - Managed Aquifer recharge – Rainwater Harvesting techniques and methods - Aquifer recharge methods - Seawater intrusion - Study and methods - Electrical methods of groundwater exploration.

Unit VI: Geology of Tamil Nadu (25 Questions)

Archean Formations - Sathyamangalam Group - Bhavani Gneissic Complex - Khondalite Group – Kolar Group - Anorthosite Complex - Archean to Proterozoic - Charnockite Group – Granites - Migmatitic Complex – Proterozoic – Proterozoic – Ultramafic - Alkaline rocks and Carbonatites – Granites - Palaeozoic to Mesozoic - Gondwana Plant beds – Cretaceous - The Cretaceous Period is divided into three Groups as under - Uttatur Group - Trichinopoly Group - Ariyalur Group - Tertiary Sediments – Lignite - Petrified Wood of Thiruvakkarai - Cuddalore Sandstone - Conjeevaram Gravels – Cenozoic - Quarternary Sediments - Mineral wealth of Tamil Nadu.

Descriptive study related to origin, mode of occurrence and use of iron ores of Kanjamalai and Kavuthimalai, Chromite and PGE of Sittampoondi, Magnesite deposits of Chalk hills, Bauxite deposits of Shevroy hills, Graphite beds of Sivaganga, Lignite deposits of Neyveli and Jayamkondam, Beach placer deposits of southern Tamil Nadu. Mode of occurrence and distribution of precious and semi-precious stones in Tamil Nadu - Silica Sands of coastal areas in Kanchipuram, Thiruvallur, Cuddalore and Nagapattinam districts- River sand deposits of Tamil Nadu.

Unit VII: Mine Development and Mining Methods (20 Questions)

Exploratory & production drilling, types of drilling and Explosives and accessories, properties, classification; Selection; Storage, transport and handling and use of explosives, different types of initiation systems, mechanics of blasting, drilling & blast design for opencast and underground mines, misfires, adverse impacts of blasting in mines and their control, controlled blasting in granites, alternatives to blasting. Different modes of entry into underground mines, their location and design. Different methods of shaft sinking, modern & mechanized techniques of shaft sinking, Drivage of drifts and tunnels covering all associated activities including continuous and tunnel boring techniques.

Suitability of surface mining and limitations, Cut-off grades, Pit limits, Stripping ratios, Design of pit slope, haul roads, benches box cuts, Earth moving machinery - shovels, continuous surface miners, bucket wheel excavators, dumpers, rippers, Dredgers, rock breakers etc., Productivity and maintenance of Heavy Earth Moving Machinery. Types of slope failures, Slope stability analysis and stabilization including dumps, In-pit-crushing and conveying, Continuous surface mining. Placer mining and solution mining, Machine availability, productive and maintenance scheduling, manpower and calendar planning.

Metal Mining: Classification of mining methods, Stopping methods – supported and unsupported, cut and fill, backfilling, etc., Techno-economic analysis of mining systems, Mining at great depths.

Unit VIII: Mine Legislation, Safety & Mine Management (20 Questions)

General provisions of Mines and Mineral Regulation and Development Act 1957 & 2023, Mineral Concession Rules 1960, Mines Act 1952, Metalliferous Mines Regulations 1961, and Mines Rules 1955, Tamil Nadu Minor Mineral Concession Rules 1959, Directorate General of Mines Safety (DGMS) issued Technical Circulars related to Surface Mining Operations, Mines Vocational Training Rules 1961, Land Acquisition Act, Explosives Rules 2008, Workmen's Compensation Act, Mine accidents, classification and

occupational diseases, Accident inquiry reports, Mine disaster management, Safety audit in Mines, Environmental protection Act 1986, Environmental Impact Notifications – 1994 & 2006 and Forest Conservation Act 1980, Ministry of Environment, Forest & Climate Change issued Notifications, Office Memorandum related to Mining Industry, Occupational Health, Risk Assessment and Management, Organization structure of a mine and a mining company, Royalty and taxation, Assessment of cost of various mining Methods operations, cost control methods, Preparation of Feasibility and detailed project reports, Mine Closer Planning and Management for sustainability.

Unit IX: Mining Machinery (20 Questions)

Different types of motive power used in mines, Wire ropes, safety devices, Hydraulic, pneumatic and gravity transport, Distribution of electrical power in mines, Mine cables, Flame-proof and intrinsically safe apparatus, Mine communication, Winding systems, Surface and pit-bottom arrangements, High angle conveying, Hydraulic & Pneumatic transport, Aerial ropeways, Dredging Equipments, Design and construction of silos and bunkers, Stacking and blending, Condition monitoring of mining machinery, Computer applications in mine planning and Equipment System.

Unit X: Mine Environment (20 Questions)

Mine illumination, Pollution due to mining - Noise, air, water and land pollution, Ground vibrations, monitoring and control, Pollution standards and remedial measures, Inundation – causes, prevention and control, Application of rock mechanics in mining, Design of water Dams, Mine rescue and recovery, investigation after an explosion, rescue organization of a mining company, Rescue and First aid in mines, Concept of environment and ecology, Landscape planning and analysis, Air quality sampling and modeling, Impact of pollution on human health. Reclamation of mined out land, Tailings management and subsidence, Environmental impact assessment, Environmental management plans, Environmental audit, Environmental clearance for mining projects, Environmental legislations, Safety and environmental protection.

23. Personnel Management, Industrial Relations, Business Administration and Social Work (PG Degree Standard)

Code: 561

Unit I: Personnel Management (15 Questions)

Definition, Evolution and Growth - Functions of Personnel Management - Factors Influencing Personnel Policy - Qualities and Qualification of Personnel Manager- Organisation of Personnel Department - Challenges and Role of Personnel Manager – Progress of Personnel Department in India

Unit II: Human Resources Planning and Development, Recruitment, Selection, Placement and Training (25 Questions)

Need for HR Planning and its types – Factors affecting manpower planning – Role of Human Resources Department - Techniques and Job description – Recruitment Practices in India Sources - Methods and Technologies for Recruitment Methods of Selection – Principles and Problems in Induction – Need and importance of Training – Steps in Systematic Training – Evolution of Training Programme

Unit III: Performance Appraisal, Motivation and Leadership (15 Questions)

Objectives and Benefits of Performance Appraisal – Characteristics of effective appraisal system - Process and Methods of Performance Appraisal – Theories of motivation and techniques of motivation – Legal and ethical issues in motivation – Theories and characteristics of leadership – Types of leaders.

Unit IV: Labour Management Relations and Labour Legislations (30 Questions)

Concept of Labour Management – Labour administrative practices – administrative agencies – labour policy – Workers participation in management and settlement of Labour disputes - Unfair labour Practices – Code of wages – Industrial Relation Code –Social Security code – Occupational safety, Health and working conditions code - Grievance Redressal Mechanism – Labour Courts and its functions – Factors affecting labour relations

Unit V: Organisational Behaviour (20 Questions)

Organisational Behaviour: Importance – Historical Development of Organisation Behaviour - Understanding Individual :Personality- Perception-Learning-Values-Attitude- Job Involvement – Organisational Commitment – Job Satisfaction – Emotions – Emotional Intelligence – Spiritual Quotient. Understanding groups: Meaning of group and group dynamics – Theories of Group Dynamics – Group Cohesiveness – Team Building- Management of change-Organisational Culture-Management of Conflict- Organizational Citizenship Behaviour.

Unit VI: Operations Management (20 Questions)

Operations Management concept, objectives and types – Characteristics of Modern Operation Management – Differences between Services and Goods – Operation Strategy – Supply Chain Management – Warehousing and Supply Chain Strategies – Supply Chain Dynamics. Operations Planning- Work study: Objectives, Procedures – Method Study and Motion Study - Work Measurement and Productivity. Total Productive Maintenance- Materials management and Purchase Management - Project management - Quality Control – Quality Movement – Continuous Improvement – Tools – Total Quality Management (TQM) concepts – ISO Quality Certification – Quality Assurance.

Unit VII: Management Information System & E-Commerce (20 Questions)

Data, Information, Intelligence, Information Technology, Information System, Functional Information Systems, DSS, EIS, KMS, GIS, International Information System-Data Base Management System- Role of information management in ERP, e-governance, Data Mining, Business Intelligence, Pervasive Computing, Cloud computing, CMM. Electronic Commerce: Technical Components of E-Commerce Functions of E-Commerce - Advantages and disadvantages of E- Commerce -Electronic Commerce and Electronic Business - Electronic Commerce Technology - Building the E-Business application - Avoiding legal issues- Web strategy: Attracting and retaining visitors - Search Engines and Portals- Cyber service - Online Banking.

Unit VIII: Fundamentals of Sociology and Psychology (15 Questions)

Sociology Definition, meaning and scope; basic sociological concepts: Society-meaning, definition and types, structure, features; social institutions; concept of social system and sub system, classification of social systems, culture: concept, characteristics, social stratification, social processes- social control, social change in India, social movements, crime and delinquency; social problems-poverty, inequality, casteism, causes and consequences.

Psychology: Definition, meaning and scope, lifespan, phases of human growth and development, (Erik Erikson and Freud) needs, tasks and challenges, influence of hereditary and environment; psychological processes for understanding behaviour, intelligence, sensation, emotions, learning, memory, attitudes, behaviour, perceptions and prejudices; life events and their impact on behaviour.

Unit IX: Health Care Practice (10 Questions)

Health: Definition and concept; Rehabilitation, definition, types and principles – UN convention on the rights of persons with disabilities; policies and programmes; Community – Based Rehabilitation. Hygiene: Personal, food and Environmental hygiene; Relationship between health and hygiene; Environmental pollution; Living conditions: housing, sanitation, waste disposal and their influence on Health.

Community health: Definition, health indicators, disease, sickness/illness, definition of public health, Communicable and non-communicable diseases: causes, prevention and treatment, Primary Health Care; Health Education;

Concept of mental health: Magnitude of mental health problems, mental health and Well Being; definition.

Health Programmes & Global Health Promoting Agencies: National Mental Health Programme, National Tuberculosis Programme (NTP), National AIDS Control Programme (NACP), National Malaria Control Programme (NMCP), Universal Immunization programme (UIP), National Cancer Control Programme (NCCP), National Health Mission (NHM), Reproductive and Child Health Programme, National Family Welfare Programme. WHO, UNICEF, FAO, UNFPA, ILO.

Unit X: Industrial Relations and Labour Welfare (30 Questions)

Industrial Relations: Concept, characteristics, Industrial Relations at plant and shop floor level, Industrial conflicts: concepts of industrial peace; cause and consequence of industrial conflict, strikes and lock-outs; conflict resolution, mediation, conciliation: arbitration and adjudication; statutory and non-statutory machinery for prevention and settlement of disputes. Trade Unions: Trade unionism in India, role in Industrial relations.

Occupational Hazards and Safety: Meaning. Occupational Hazards, Industrial Health and Industrial Safety. Industrial Accidents-causes and prevention. Meaning of Safety and Need for safety in Industries. Job stress. Problems of Job stress with special reference to new generation industries.

Statutory Provisions In India: Statutory Provisions in India connected with health, safety and welfare of workers. Introduction to The Factories Act, 1948- Statutory Provisions relating to Labour Welfare, Industrial Health and Industrial Safety in Factories. Role of H.R. Managers in Labour Welfare.

Labour Welfare: Concept, definition, philosophies, need, objectives, principles, scope and limitations of labour welfare; Historical development of labour welfare in India. Statutory and Non-Statutory Welfare Provisions: Industrial Counseling- Pre-retirement, Quality of work life. Social security, social security measures; Standardization, Wage policy, Wage incentives, bonus and profit sharing. Collective Bargaining: Meaning, goal, phases, pre- requisites, principles, strategies and negotiation skills, factors influencing collective bargaining, Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013.

HR System Concept and functions: HRM, HRD & HR; evolution, Asian trends; HRD system and sub-systems; elements, goals, importance of HRD in Industry; 360 Degree feedback; leadership and leadership development; mentors & modeling; Organizational commitment CSR in HR.

24. Physics, Chemistry, Biology, Computer Science and Forensic Science (PG Degree Standard)

Code: 575

Unit I: Fundamentals of Physics (20 Questions)

Impulse - Impact - Laws of Impact - Loss of Kinetic theory - Motion of two interacting bodies - Reduced mass - Rigid body dynamics. **Relativity:** Postulates of Special theory of relativity - Mass Energy Equivalence. **Space Physics:** Escape Velocity - Orbital Velocity - Geo Stationary Orbits and Satellite Communication - Remote Sensing.

Basic ideas of Interference, Diffraction and Polarisation - Principle of LASER and its applications - Coupling Schemes - Zeeman effect -Paschen Back effect - Rotation, Vibration and Rotation -Vibration Spectra - Frank Condon principle - Laws of thermodynamics - Entropy - Thermodynamic potentials - Maxwell's equations and its applications, Gibb's phase rule - Phase transition -Vanderwaal's equation of State. Crystal Classes and Systems - 2D, 3D Lattices - Lattice heat capacity - X-rays - X-ray diffraction - Superconductivity - Super Conductors, Different types of magnetic materials - Binding energy -Propagation of electromagnetic waves in non conducting and conducting medium - Reflection and refraction at a plane interface between dielectrics - Radiation from a localised source. -Fourier transform infrared, Raman, NMR and ESR spectroscopy- Principle, technique and applications

Unit II: Electronics (20 Questions)

Ampere's circuital law and its application - theory of Ballistic Galvanometer - Potentiometer - measurement of current, voltage and resistance. Semiconductor diode and transistor - Optoelectronic devices - Photo diode, Photo transistor, LDR, LED, LCD, Special Semi conductor devices - JFET, MOSFET, UJT- Operational amplifier -Characteristics and applications - 555 timer. Logic gates -Half and Full adder and subtractors-Karnaugh map -NAND - NOR networks - flipflops -counters and shift registers- Active Filters- Analog to digital and digital to analog converter. Modulation and demodulation techniques - Principle of radio communication - AM and FM transmission - RADAR Principle- Television transmission and reception - Propagation of Light in an Optical fibre. ECG and EEG techniques - Basic ideas of CT and MRI Scan.

Unit III: General Chemistry (20 Questions)

Reaction Kinetics: Rate laws - rate constant - order and molecularity of reactions - I, II, III, and zero order reactions - concept of Arrhenius theory - Collision theory and Transition state theory -catalysis.

Acids and Bases: Bronsted and Lewis acids and bases - pH and pKa acid - base concept in non - aqueous media - HSAB concept - Buffer Solutions. Redox Reactions: Oxidation numbers, Redox potential, Electrochemical series - application of EMF measurements -Redox indicators.

Structure and Bonding: Electronic configuration of atoms, periodic properties of elements, Ionic radii, ionization potential electron affinity, electro negativity, concept of Hybridization, molecular orbitals and electronic configuration of homo nuclear and hetero nuclear diatomic molecules, shapes of polyatomic molecules. Types of chemical bond (weak and strong) inter molecular forces, structure of simple and covalent bonds- covalent character in ionic bond and partial ionic character - lattice energy.

Organic Reaction Mechanism: SN1, SN2 mechanisms - addition substitution, elimination and rearrangements -free radical mechanism - aromatic substitution -and stability of reactive intermediate (Carbocations, Carbanion's free radicals, nitrates and benzyne) - Polar effects - Hammett's equation and its modification.

Stereochemistry: Optical and geometric isomerism E. Z and R.S notation's IUPAC Nomenclature of simple organic and inorganic compounds.

Unit IV: Chemical and Instrumental Analysis (20 Questions)

Titrimetric Analysis: Classification of reaction in titrimetric analysis - Standard Solutions - Normality, Molarity and Molality - concentration units - Primary and Secondary standard - neutralization indicators - self indicators and external indicators- acid base titrations - precipitation titrations - redox titrations.

Qualitative Analysis: Semimicroqualitative analysis of cations like Se, Te, W, Mo, Ce, Th, Zr, V, Ca, Ba, Ni, and Mg.

Basic Principles, Instrumentation and applications of Ultraviolet-visible (UV-vis.) spectroscopy; Beer-Lambert's law, solution preparation and small molecules analysis and Flow Injection analyzer-Nuclear Magnetic resonance spectroscopy (NMR), small molecule analysis. Flame spectrometry, Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma -Mass Spectrometry (ICP-MS), Inductively Coupled Plasma Emission spectroscopy, Fluorimetry-Chemiluminescence's Detector system, X-ray fluorescence spectroscopy (XFS),

Chromatographic Techniques: Basic Principles of chromatography, Instrumentation and application of chromatography - Paper, thin layer chromatography (TLC), High-performance Liquid chromatography (HPLC) and Gas chromatography (GC), Gas-Chromatography with Mass Spectrometer (GC-MS), Liquid Chromatography with Mass spectrometry (LC-MS).

Unit V: Zoology (20 Questions)

Salient features of Invertebrata and Vertebrata - Structural Organization of animal cell - Types of Muscle - Blood and its composition- grouping - Blood cells - Structure of sperm and Egg. Human genetics - Pedigree analysis - Karyotyping - Chromosome structure and functions - Beneficial and harmful insects - Exploiting insects olfaction in forensic studies - Ants, blowflies and beetles in forensic investigation. Anthropology scope - Basic concepts, types - Applied and developmental Anthropology - Forensic anthropology and criminal investigations. DNA finger printing technology in forensic investigations. Chemistry of Biomolecules - Types of carbohydrates, proteins and lipids. Metabolism of Bio molecules - Nucleic acids - Types, Structure and functions of DNA & RNA, Enzymes - Properties - Marker enzymes - Classes and function of Hormones - Pheromones. Theories of Origin of life.

Unit VI: Botany (20 Questions)

Plant Diversity: Salient features and economic importance of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

Cell Biology: Cell Organelles and its functions. Cell cycle, Cell division, Tissuesystem and secondary growth

Plant pathology: Bacterial, fungal and viral diseases of plants.

Embryology: Micro sporogenesis, Megasporogenesis, Polyembryony, Doublefertilization.

Genetics: Mendelism, Linkage, crossing-over, chromosome mapping.

Plant adaptations: Hydrophytes, Xerophytes, Mesophytes, Epiphytes, Halophytes and Mangrove

vegetation. Biodiversity conservation methods.

DNA profiling: Genetic code, Mutation and DNA polymorphism, Recombinant DNA technology.

Isolation of DNA: Agarose Gel Electrophoresis, PCR, DNA Sequencing, RAPD, RFLP, DNA Finger printing, STR Typing.

Isolation of Proteins: SDS-PAGE, RIA, ELISA, FISH. Ames test, Comet Assay.

Microbiology: Microscope and its types. Histology and Staining techniques. Microbial culture and preservation techniques. Host-parasite interaction, Microbial diseases, Bioterrorism and Biohazards.

Unit VII: Computer Fundamentals and Applications (20 Questions)

Computer Peripherals-Operating System Fundamentals- File Systems & Management -Processors – Memory Devices - Network Fundamentals- Word Processing- Spread Sheets- Power Point Presentation- Database Fundamentals - Web Fundamentals - Browsers-Hypertext Markup Language (HTML) - Java Script- Web pages - Internet- Cloud Services- AI Fundamentals and its Applications- Cyber Security - Authentication - Firewalls-E-Commerce Applications- Data Protection- Messaging Tools -Mail Services - Internet of Things (IoT).

Unit VIII: Fundamentals of Forensic Science and Crime Scene Investigation (20 Questions)

Forensic science - Definition- Organisation and functions of Forensic laboratory- Foot and tire Impressions: Walking pattern- Finger prints: principles, patterns, classification - Identification of tool marks- Firearms, bullet and cartridge case identification, Pellets and Wads - Fire and Arson - Explosives; classification- Combustion, detonation and explosion- Military and Industrial Explosives - Physical evidence, classification and significance- Crime scene examinations- Documentation-recognition, collection, preservation of transportation for laboratory examinations- Fundamentals of Crime Scene Photography.

Unit IX: Advanced Forensic Techniques in Documents, Toxicological and Bio-Evidence (20 Questions)

Questioned documents: Identification of Hand writing, Typed and Forged signatures - Broken glass: glass fractions, direction of force - Forensic examination of soil and paints, polygraph and voice identification- Toxicology: classification, mode of action of poison - Narcotic drugs, alcoholic beverages- Examination of biological fluids: blood, seminal, vaginal and saliva stains- Examination of fibres, hair, bones, nail, teeth, tissues and skull.

Unit X: Criminology, Penology and Victimology (20 Questions)

Concept of Crime - Nature and its Scope - Typology and Patterns of Crime - Schools of Criminology - Causation of Crime- Theories of Crime: Psychological, Sociological and Tentative- Crime and Economic Conditions - Media , Race and Crime- Organised Crimes - White Collar Crimes - Cyber Crimes - Sexual Offenders - Green and Environmental Criminology - Alcoholism , Drug Addiction and Crime - Crimes of the powerful - Methods and Counting Crime - Crime Statistics - Punishment: Theories, Forms of Punishment and Judicial Sentencing - Capital Punishment - Criminal Law Courts - Prisons - Parole - Juvenile Delinquency - Crime Prevention - Victimology: Branches of Victimology - Restorative Justice - Risk and Protective factors - Formal and Informal responses to victimisation - Victims: Victimisation Cycle - Stages, Effects and Theories of Victimisation

25. Social Work (PG Degree Standard)

Code: 370

Unit I: Social Work Profession (20 Questions)

Definition and meaning: Historical evolution of Social Work – UK, USA and India; Growth of Social Work as a Profession; Social Work concepts, methods, fields; international and national professional bodies/ forums; status and problems of the profession in India.

Social Work ideologies: Socialism, marxism, equality, equity, social justice and humanitarianism; Indian socio-cultural and religious thought, social reforms purusharthas; Gandhian Social Work; contributions of religions- Hinduism, Buddhism, Jainism, Islam and Christianity; Rights based approach.

Philosophy of Social Work Profession: values, beliefs, principles and code of ethics; Social Work theories; International Social Work – basic concepts, Global Agenda and Global standards for practice; Human Rights and Social Work; Constitutional safeguards; India as a welfare state; role and contributions of voluntary organizations, INGOs, NGOs and CSOs.

Unit II: Fundamentals of Sociology and Psychology (20 Questions)

Sociology Definition, meaning, scope and relevance to social work; basic sociological concepts: Society-meaning, definition and types, structure, features; social institutions; concept of social system and sub system, classification of social systems, culture: concept, characteristics, social stratification, social processes- social control, social change in India, social movements, crime and delinquency; social problems-poverty, inequality, casteism, causes and consequences.

Psychology: Definition, meaning and scope, Psychology and Social Work; lifespan, phases of human growth and development, (Erik Erikson and Freud) needs, tasks and challenges, influence of hereditary and environment; psychological processes for understanding behaviour, intelligence, sensation, emotions, learning, memory, attitudes, behaviour, perceptions and prejudices; life events and their impact on behaviour.

Unit III: Direct Methods of Social Work Practice–I (10 Questions)

Social Case Work: Historical development, CW as a direct method of Social Work, definition and meaning, philosophy, values, principles, skills, components of social case work, case work relationship; empathy, skills in building relationship, transference and counter transference; difference between casework, counseling and psychotherapy for different target groups, the helping process, approaches: Skills-referrals, interview, observation, collateral contact; types of recording, application of CW in various settings; limitations of the method.

Social Group Work: Definition of group, types, and characteristics of groups; Historical development of GW as a direct method in Social Work, definition and meaning, purpose, objectives, values, skills, principles of GW, phases of group work process-group processes and dynamics-stages in group development, the influence of new comers on group processes, isolation, rejection in groups, group-bond, subgroups, clique, dyad, triad, group norms, group membership, group cohesiveness, group pressure, group morale, leadership, team building, decision making, problem solving, conflict management, communication; role clarity in a group; use of sociometry; Group Work models; social goals model, remedial model, reciprocal model, Application in various settings; types of recording in Group Work.

Unit IV: Direct Methods of Social Work Practice–II (10 Questions)

Community Organisation: Definition, philosophy, principles, goals, scope of CO; community as a social system; sub systems; types and characteristics community power structure, community dynamics, evolution of CO as a direct method in social work, community organization models: Rothman- social planning, locality development and social action; Murray Ross-general content, specific content and process objective; process and skills in community organisation.

Social Action: Concept, definition, aims and objectives, scope, social action as a method in social work, paradigm of five elements: causes, change agent, change target, change channels, change strategy, strategies and tactics for social action: channels topology; skills of a social activist, models and approaches to social action: Paulo Freire- Martin Luther King ,Saul Alinsky, social action movements in India- Narmada Bachao Andolan, Chipko movement, Dalit movements, women's movements, Contemporary Social Reforms movement.

Unit V: Indirect Methods of Social Work Practice-I (15 Questions)

Social Work Research: Definition, objectives, scope, characteristics and functions– scientific method, concepts, variables, types of research, research as an indirect method of social work, qualitative methods – case study, Ethnography, Grounded, Theory, Content Analysis, Narrative, SWOC; quantitative research Methods-Tools and techniques in qualitative data collection: Observation, focus group discussion, unstructured in-depth Interview; iteration, triangulation and saturation. Mixed Methods: problem formulation: formulation of hypotheses; typology of research designs; ethical issues; sampling: definition, types, techniques: probability and non- probability

sampling; sampling errors; data sources; types of data-nominal, ordinal, discrete numeric, continuous, sources of data; methods, tools and techniques of data collection, classification and coding, tabulation, analysis and interpretation–research reporting.

Statistics: Meaning, definition, limitations and uses- frequency distribution- construction of frequency tables–diagrammatic and graphical representation; measures of central tendency – mean, median, mode, measures of dispersion- standard deviation, variance, quartile range, measures of correlation and regression; tests of significance: hypothesis testing; Type I & Type II errors, Level of confidence, degrees of freedom Chi square, ‘t’ test, reliability and validity methods; Scales: Rating scales, Attitude scales–Likert, Thurstone, Guttman; using software for data analysis.

Unit VI: Indirect Methods of Social Work Practice-II (20 Questions)

Social Work Administration: Concept, definition, characteristics, Social work Administration as an indirect method of Social work; Organizational structure, boards and committees: executive: functions and qualities - administrative process: policy formation, planning, decision making, co- ordination, communication; Human Resource Management: selection of staff, orientation, placement, service conditions, promotions, discipline, welfare programmes for staff -financial administration: budgeting, accounting, bookkeeping and fund-raising-office administration: office management and maintenance of records- supervision, evaluation and public relations; Central Social Welfare Board, State Social Welfare Board, Nehru Yuvak Kendra, Ministry of Social Defence Department of Social Welfare; Role of Voluntary Agencies, Board, Trustee, Committees, Executives –Roles and Functions; Laws related to NGOs; Registration of organizations: Tamil Nadu Societies Registration Act 1975, Trust Act 2001, Foreign Contribution (Regulation) Act 1976, Tax Exemptions and Foreign grants; Role and contribution of international funding organizations; Project and Project Cycle Management; Project Proposal Writing, Overview of Logical Framework Analysis; Types and Steps, Format; Fund-Raising (Types, Methods, Skills); Monitoring and Evaluation of Projects.

Unit VII: Specialization in Health Care and Social Work (15 Questions)

Health: Definition and concept; Healthcare approaches: patient as a person, psychosomatic approach, holistic approach. Problem assessment process: Rehabilitation, definition, types and principles, levels-prevention, promotion and tertiary; rehabilitation therapies; gender dimensions in disability, rehabilitation in various settings – UN convention on the rights of persons with disabilities; policies and programmes; Community –Based Rehabilitation.

Community health: Definition, health indicators, disease, sickness/illness, definition of public health, changing concepts, primary healthcare: preventive, curative and social medicine. wellbeing, HDI; Communicable and non-communicable diseases: causes, prevention and treatment, Primary Health Care; Health Education; Skills of Social Worker in healthcare.

Concept of mental health: Magnitude of mental health problems, changing trends in mental healthcare; psychiatric assessment: common mental disorders (as per ICD 10); mental health and Well Being; definition, history and scope of psychiatric social work, changing perspectives of psychiatric social work, application of methods in psychiatric settings-theory and models; psychoanalytical, psycho social, transactional analysis, family therapy, crisis intervention, behaviour therapy, rational emotive therapy, group therapy & strengths based approach; counselling: definition, principles, goals, approaches and techniques- CBR and Community Mental Health, Mental Health Act 2018.

Unit VIII: Specialization in Rural and Urban Community Development (35 Questions)

Rural Community development: Definition, philosophy, objectives, scope; history of RCD; Rural development: need and importance, approaches, power structure, caste and untouchability, poverty and indebtedness; land reform measures, Farm laws, agricultural laborers, marginal and small farmers; water shed management;

Development Administration: Organization and administration of rural, tribal and urban development from block to National levels. Panchayat systems and local self-government in India; rural development programmes and policies; implementation strategies, PMERG, SUMCY, PMKVY tribal communities: Adivasis, Indigenous, aborigines; tribal social systems and structures; types, characteristics, tribal social systems and structures; belief systems, culture-indigenous vs.

mainstream, Atrocities against SC/ST and Constitutional Provisions for the safeguard of SC/ST.

Urban Community development: Definition, philosophy and objectives, history of UCD, scope; Slums: definition, causes, characteristics, functions, classification, approaches, theories and culture of slums; in and out migration, urbanization, urbanism: theories of urbanization, Unorganized/Informal sectors; urban services and urban deficiencies; 74th amendment and salient features of Nagarpalika Act; structure and functions of Urban Development Agencies: Urban Development Programmes: role of community development worker; rural, tribal and urban policies; tools and techniques for development practice; Application of social work methods in rural, tribal and urban communities, Role of CSR in Community Development.

Disaster: Definition, types, problems, Disaster Management and its process.

Unit IX: Specialization in Family and Child Social Work (35 Questions)

Family: Definition, concept, characteristics, types, functions, family patterns; marriage: forms, functions, changing situations in marriage, challenges, separation and divorce; assessment of family needs; laws on family and marriage; **Gerontology and Geriatric Care:** Definition, Theories of Aging, Dimensions of Aging, disabilities; Interventions with older persons; Policies and programmes for senior citizens -NPOP and Maintenance and Welfare of Parents and Senior Citizens Act 2007, stress management of caregivers, Role of government and non-governmental services, institutional and non-institutional; hospice & palliative care.

Youth: Definition, demographic profile; Youth Policy–2014; needs of youth; impact of westernization, modernization, urbanization and globalization; problems of youth; programmes for rural/urban youth, career counselling, Organisations and Movements in India.

Women: Sex and gender, gender identity; gender stratification; sex ratio in India; feminism: concept, meaning and definition and types; empowerment: concept, definition, types; GDI, GEM; Constitutional provisions and protective laws for women; special initiatives and programmes for women, national and state commissions; Convention on elimination of all forms of discrimination against women and girls (CEDAW) 1982, micro finance and self-help groups (SHGs), challenges of Indian women Status of Women in India, Problems of Women, Cyber Security.

Children: Demography; Constitutional safeguards; UNCRC, Post 2015 Development Agenda; Common Problems of Children-School Dropouts, Truancy, street children, child labour, child abuse, child trafficking, child prostitution, Child marriage, Teenage Pregnancy, Children and Gaming Addiction, Social Media and related problems, disabled children, the girl child; Child services: mechanisms, National commission for protection of child rights/ State commission for protection of child rights, District Child protection Unit; Legislations for Protection of Children-POCSO, JJ Act, Information Technology Act-2000; Approaches: Adoption – sponsorship and foster care, Institutional Care; application of Social work methods in Family and Child setting.

Unit X: Specialization in Industrial Relations, Labour Welfare and Social Work (20 Questions)

Industrial Relations: Concept, characteristics, Industrial Relations at plant and shop floor level, Industrial conflicts: concepts of industrial peace; cause and consequence of industrial conflict, strikes and lock-outs; conflict resolution, mediation, conciliation: arbitration and adjudication; statutory and non-statutory machinery for prevention and settlement of disputes. Trade Unions: Trade unionism in India, role in Industrial relations.

Labour Welfare: Concept, definition, philosophies, need, objectives, principles, scope and limitations of labour welfare; Historical development of labour welfare in India. Statutory and Non-Statutory Welfare Provisions: Industrial Counseling- Pre-retirement, Quality of work life. Social security, social security measures; Standardization, Wage policy, Wage incentives, bonus and profit sharing. Collective Bargaining: Meaning, goal, phases, pre- requisites, principles, strategies and negotiation skills, factors influencing collective bargaining, Role of Social worker in industrial setting.

HR System Concept and functions: HRM, HRD & HR; evolution, Asian trends; HRD system and sub-systems; elements, goals, importance of HRD in Industry; 360 Degree feedback; leadership and leadership development; mentors & modeling; Organizational commitment CSR in HR.

26. Statistics and Mathematics (Degree Standard)

Code: 505

Unit I: Descriptive Statistics (12 Questions)

Uses, Scope and limitations of Statistics – Collection, Classification and Tabulation of data – Diagrammatic and Graphical representations – Measures of location, dispersion, skewness and kurtosis – Correlation and regression – Curve fitting – Linear and quadratic equations by the method of least squares.

Unit II: Probability Theory and Probability Distribution (30 Questions)

Probability – Addition, Multiplication and Baye's Theorems and their applications. Random variables – Univariate and Bivariate – Probability distributions – Marginal and conditional distributions – Mathematical expectations – Moments – Moment generating functions – Characteristic function and cumulant generating functions - Discrete distributions – Binomial, Poisson, Geometric distributions, Continuous distributions – Uniform, exponential, normal distribution- Sampling distributions and Standard error – Student's "t", Chi-square and F – Distributions and their applications.

Unit III: Estimation Theory and Test of Hypothesis (30 Questions)

Estimation – Point estimation – Properties of estimators – Cramer-Rao inequality, Rao-Blackwell theorem, MLE and method of moments estimation – Interval estimation for population mean and variance based on small and large samples.

Hypothesis testing – Null and Alternative Hypotheses – Types of errors – Level of Significance – Test procedures for large and small samples – t, F, Chi-square and Z Tests.

Unit IV: Sampling Theory and Design of Experiments (24 Questions)

Simple random sampling – Stratified, systematic, cluster (Single stage) – Estimation of mean and variance in SRS – Sample Survey Organisation – CSO and NSO – Sampling and non-sampling errors. Analysis of Variance – Principles of design – CRD, RBD and LSD – 2^2 Factorial experiments.

Unit V: Time Series and Vital Statistics (12 Questions)

Time series – Components of time series – Trend and Seasonal Variations – Determination and elimination.

Vital Statistics – Importance – Collection – Mortality and its measurements – Life table construction and uses – Fertility and its measurements.

Unit VI: Statistical Computing using MS-Excel and SPSS(12 Questions)

Introduction to MS-Excel – MS-Excel Options using Excel Shortcuts – Link the Data in Rows, Columns and Sheet – Functions: Logical Functions – Math and Statistical Functions – Charts-Plotting Density Function and Distribution Function. Understanding on the usage of Statistical Package SPSS.

Unit VII: Algebra and Calculus (25 Questions)

Theory of Equations: Relations between roots and Coefficients – Complex roots – Irrational roots – Related roots - Transformations of equations – Reciprocal equations.

Matrix Theory: Symmetric – Skew Symmetric – Hermitian – Skew Hermitian – Orthogonal and Unitary Matrices – Rank of a matrix – Consistency and Solutions of Linear Equations – Cayley Hamilton Theorem – Eigen values and Eigen Vectors.

Differential Calculus: n^{th} derivative – Leibnitz's theorem and its applications.

Integral Calculus: Methods of integration – Properties of definite integrals – Double Integrals – triple integrals – Beta and Gamma functions and their properties.

Unit VIII: Differential Equations Laplace Transforms and Vector calculus (25 Questions)

First order but of higher degree equations – solvable for p, solvable for x, solvable for y, Clairaut's form.

Second order differential equations with constant coefficients with particular integrals for e^{ax} , x^m , $\cos mx$, $\sin mx$, $e^{ax} \cos mx$, $e^{ax} \sin mx$.

Partial Differential equations: Formation of Partial Differential equations by eliminating arbitrary constants and arbitrary functions – First order Partial Differential equations – Complete integral – Singular integral –

General integral – Charpit's method – standard types $f(p,q)=0$, $f(x,p,q)=0$, $f(y,p,q)=0$, $f(z,p,q)=0$ and $f(x,p)=f(y,q)$ – Clairaut's form and Lagrange's equations – $Pp+Qq=R$.

Laplace transform – Inverse Laplace transform (usual types) – applications of Laplace transform to solution of first and second order linear differential equations (constant coefficients).

Vector Differentiation: Gradient, divergence, curl, directional derivative, unit normal to a surface.

Vector integration: line, surface and volume integrals – Applications of Gauss, Stokes and Green's theorems – simple problems.

Unit IX: Algebraic Structures (15 Questions)

Groups, subgroups, cyclic groups and properties of cyclic groups – Lagrange's Theorem – Normal subgroups – Homomorphism – Permutation groups.

Vector Spaces: Definition and examples – linear dependence and independence – dual spaces – inner product spaces.

Unit X: Real and Complex Analysis (15 Questions)

Sets and Functions: Sets and elements – Operations on sets – functions – real valued functions – equivalence – countability – real numbers – least upper bounds.

Sequences of Real Numbers: Definition of a sequence and subsequence – limit of a sequence – convergent sequences – divergent sequences – bounded sequences – monotonic sequences.

Series of Real Numbers – Convergence and divergence – series with non-negative numbers – alternating series – conditional convergence and absolute convergence.

Analytic functions: Functions of a complex variable – limits – theorems of limits – continuity - derivatives – differentiation formula - Cauchy-Riemann equations, sufficient conditions – Cauchy – Riemann equations in polar form – Harmonic functions.

Complex Integrals: Definite integrals – Cauchy's theorem - Cauchy's integral formula – Formula for higher derivatives.

27. Statistics and Mathematics (PG Degree Standard)

Code: 506

Unit I: Probability and Distribution Theory (25 Questions)

Random variables and Distribution function, Distribution function of a random vector – Mathematical expectation and conditional expectation

Chebyshev's inequality – Convergence in probability – Convergence in distributions – Weak and Strong laws of large numbers – Central limit theorems (Lindeberg-Levy, Liapunov's)

Introduction to distributions:

Discrete distributions: Negative binomial and Hyper geometric distributions

Continuous distributions: Cauchy, Beta, Gamma, Weibull and Log-Normal.

Sampling distributions: Non central t, F and Chi-square distributions and their properties – Bivariate Binomial, Poisson Normal and their properties.

Unit II: Estimation Theory and Testing of Hypotheses (25 Questions)

Introduction to estimation theory and properties of estimators.

Theorems and inequalities: Cramer – Rao inequality, Batacharya inequality, Rao – Blackwell, Neyman – Fisher factorization theorems with examples.

Methods of estimation: Method of moments, Maximum likelihood, Minimum Chi-Square and method of least squares, Bayesian estimation – Introduction -Point and interval estimation and Bayes estimator under squared error loss function.

Introduction to testing of hypotheses: Basic concepts and - More powerful Test - Neyman – Pearson lemma: UMP and unbiased tests – MLR property and its uses for construction of UMP tests.

Non-Parametric tests: Run test, Median test, Mann-whitney test, Wilcoxon test, Kolmogoro-Smirnov test (one and two sample test procedures), Kruskal-Wallis test and SPRT test

Unit III: Regression analysis (20 Questions)

Introduction to linear regression model – Simple and multiple regression models: Description of data model – Estimation and testing of hypotheses on regression coefficients – Adequacy measures – Predicted values and standard error – Evaluation of fit – Analysis of residuals.

Multicollinearity and its effects on inference and forecasting – Selection of variables – Forward selection procedure (step-wise method).

Introduction to Generalized Linear Models: Components of GLM – Logistic regression model- Classification in two population, Fitting and interpretation.

Unit IV: Sampling Theory and Design of Experiments (25 Questions)

Ratio and Regression estimators, estimation under double sampling – Cluster sampling – Two stage sampling – Sampling and Non sampling errors.

Contrasts: Linear and orthogonal contrasts – Linear models: Fixed, random.

Principles of experimental designs – Construction and analysis of 2^3 and 3^2 fractional experiments – Partial and complete confounding – BIBD- PBIBD (Two Associates only) - Youden Square design.

Unit V: Statistical Quality Control and Time series (15 Questions)

Acceptance sampling: Sampling inspection – AOQL, LTPD, Producers' and consumers' risks – Single, double, sampling plans for attributes and variables – OC, ASN, ATI and AOQ curves. Six sigma – Over view and implementation.

Time series – Components, uses – Determination of trend by Method of moving averages, fitting of first and second order degree, seasonal indices and the estimate of the variance for random components, autoregressive, moving averages and ARIMA models.

Unit VI: Machine Learning Techniques through R and Python Languages (10 Questions)

Overview of R language – Defining the R project – Objects and data structures – Graphics using R language – Calculation of measures of central tendency, dispersion, correlation and fitting of regression lines (Linear and logistic).

Overview of Python Language – Regular expressions –Scientific libraries: Numpy, Scipy, Matplotlib and Pandas.

Machine Learning: Supervised learning – Classification (KNN and Naïve Bayes) and Regression (Linear and Logistic) techniques – Unsupervised learning (Clustering methods).

Unit VII: Algebra and Functional Analysis (20 Questions)

Algebra:

Groups – Subgroups – Normal subgroups – homomorphisms – Isomorphism – Cayley's theorem – Cauchy's theorem – Sylow's theorem – Finite abelian groups – Rings – Euclidean rings – Polynomial rings – Polynomial over the rational field – Polynomials over Commutative rings – Division rings – Frobenius theorem.

Field: Finite fields – Wedderburn's theorem, Extension Fields. **Functional Analysis:**

Fundamentals of normed Linear spaces, bounded Linear maps on Banach spaces, open mapping theorem, Bounded operators of Hilbert spaces.

Unit VIII: Real and Complex Analysis (20 Questions)

Limit, Continuity, types of discontinuities, infinite limits, function of bounded variation, metric spaces. Reimann Integral –Fundamental theorem of calculus – mean value theorem. Reimann Stieltjes Integral.

Complex Analysis:

Local properties of analytic functions – Removable singularities Taylor's theorem - Zeros and poles, local mapping – maximum principle – Harmonic functions – power series expansions – Weierstrass theorem – Taylor's series, Laurents series.

Unit XI: Differential Equations(20 Questions)

Linear differential equations of higher order – Linear dependence and Wronskian basic theory – solutions in power series – Introduction to second order linear equations with ordinary points. Legendre equations and legender polynomial, Second order equations with regular singular points, Bessel equations. Partial

differential equations; first order, Complete Integral, General Integral, Singular Integral, Compatible systems of first order equation, Charpit's method.

Unit X: Differential Geometry (20 Questions)

Curves, analytic representation, arc length, tangent, oscillating plane, Curvature, torsion, formula of Frenet, Contact, natural equations, helices, involutes & evolutes, Elementary theory of surfaces – Analytic representation – first & second fundamental forms, normal – tangent form, developable surfaces, Euler's theorem, Dupin's indicatrices – Conjugate directions, Triply orthogonal system of surface.

28. Statistics, Mathematics and Economics (Degree Standard)

Code: 504

Unit I: Algebra and Differential Calculus (20 Questions)

Theory of Equations: Relations between roots and Coefficients – Complex roots – Irrational roots – Related roots – Transformations of equations – Reciprocal equations.

Matrix Theory: Symmetric – Skew Symmetric – Hermitian – Skew Hermitian – Orthogonal and Unitary Matrices – Rank of a matrix – Consistency and solutions of Linear Equations – Cayley Hamilton Theorem – Eigen values and Eigen Vectors.

Differential Calculus: n^{th} derivative – Leibnitz's theorem and its applications – Partial differentiation – Maxima and Minima of functions of two independent variables.

Unit II: Integral Calculus and Differential Equations (20 Questions)

Integral Calculus: Methods of integration – Properties of definite integrals – Reduction formulae – Double Integrals – triple integrals – Applications to area, surface and volume – simple problems.

First order but of higher degree equations – solvable for p , solvable for x , solvable for y – simple problems. Second order differential equations with constant coefficients with particular integrals for e^{ax} , $\cos mx$, $\sin mx$, $e^{ax} \sin mx$ – simple problems.

Partial Differential equations: Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions – First order P.D.E. – complete integral – Singular integral – general integral – standard types $f(p,q) = 0$, $f(z,p,q) = 0$, $f(x,y,p,q)=0$, Clairaut's form and Lagrange's equations – simple problems.

Unit III: Vector Calculus and Operations Research (25 Questions)

Vector Differentiation: Gradient, divergence, curl, directional derivative, unit normal to a surface.

Vector Integration: line, surface and volume integrals – Applications of Gauss, Stokes and Green's Theorems – simple problems.

Linear programming: Formulation – graphical solution – simplex method – Big-M method – Transportation problem – Assignment problem.

PERT and CPM: project network diagram – Critical path – PERT computations.

Inventory models: Basic concepts – EOQ models (i) Uniform demand rate infinite production rate with no shortages models (ii) Uniform demand rate with finite production rate with no shortages models.

Unit IV: Descriptive Statistics and Fitting of Simple equations (20 questions)

Introduction to Statistics, Uses, scope and limitations - Collection, Classification and Tabulation of data - Diagrammatic and Graphical representations of Data – Measures of location, dispersion, skewness and kurtosis – Bivariate data- Scatter diagram – Correlation, Partial correlation and regression – Fitting of Linear and quadratic equations by the method of least squares.

Unit V: Probability and Statistical Inference (25 questions)

Introduction to Probability - Addition, Multiplication and Baye's Theorems and simple applications. Random variables and Expectation– Univariate Probability distributions – Binomial, Poisson, Geometric, exponential and normal distributions (Mean & Variance). Sampling Techniques – Simple Random Sampling – Stratified and Cluster (Single Stage) - Estimation – Properties, Point Estimation by the method MLE. Tests of Hypothesis – Important terminology – Test procedures for large and small samples (z , t , Chi-square, F).

Unit VI: Time Series, Index Numbers and Statistical computing using MS-Excel (20 Questions)

Time series – Components – Determination of Trend (Moving Average, Linear Trend by LSE) – Index Numbers – Construction of Simple, weighted Cost of living index numbers.

Statistical Computing using MS-Excel: Introduction to MS-Excel – MS-Excel Options using Excel Shortcuts – Link the Data in Rows, Columns and Sheet - Functions: Logical Functions -Math and Statistical Functions – Regular Charts-Plotting Density Function and Distribution Function.

Unit VII: Micro Economics (15 Questions)

(a) Definition, Scope and Importance of Micro Economics – Law of Demand – Elasticity of Demand – Utility Analysis – Consumer Surplus. (b) Production Function – Factors of Production – Producer's Surplus – Economies of scale – Cost and Revenue curves in the Short-run and Long-run – Welfare Criteria – Adam Smith, Bentham, Marshall, Pigou and Kaldor.

Unit VIII: Macro Economics (15 Questions)

Definition, Nature and Scope of Macro Economics – Circular flow of Income in an Open Economy – National Income Accounting – Definition – Concepts: GNP, NNP, GDP, NDP, Personal Income, Per Disposable Income & Personal Savings, Per Capita Income – Keynesian Psychological Law of Consumption – Investment function – Marginal Efficiency of Capital – Multiplier – Accelerator. Inflation – Deflation – CPI – WPI – Phases of Trade cycle.

Unit IX: Stabilisation Policies (20 Questions)

(a) **Monetary Policy:** Barter System – Demand for and supply of money – Functions of money, Functions of Central and Commercial Banks – Money Multiplier – Monetary Policy Instruments – SLR, CRR, OMO & LAF – Functions of Money Market – Capital Market.

(b) **Fiscal Policy:** Taxation – Types of Taxes – Canons of Taxation – Public Expenditure – Causes and Growth – Types of Public Expenditure – Public Debt – Internal and External Public Debt - Budget – Deficit and deficit financing – FRBM (Fiscal Regulation and Budgetary Management) – Fiscal Federalism.

Unit X: Indian Economy: (20 Questions)

(a) **Agriculture:** Contribution of the Agriculture sector to National Income and Employment – Agriculture Price Policies – Agriculture Statistics – Modern Technology in Agriculture Statistics – Agriculture Finance and Marketing.

(b) **Industry:** Contribution of the Industrial Sector to National Income and Employment – MSME and Large Scale Industries – Industrial Policy Resolutions – Industrial finance.

(c) **Service Sector:** Contribution of the Services Sector to National Income and Employment –Transport, Communication and IT Sectors.

(d) **Economics of Planning:** Five Year Plans – Planning Commission – Finance Commission – NITI Aayog – Government Welfare and Employment Generation Programmes.

(e) **Population:** Demographic transition and Demographic Statistics – Poverty Alleviation Programmes

29. மரபு கட்டடக்கலை மற்றும் சிற்பக்கலை (Traditional Architecture and Sculpture) (பட்டப்படிப்பு தரம்)

குறியீடு: 511

அலகு I: கோயில் கட்டடக்கலை மற்றும் சிற்பக்கலை இலக்கணம்: (30 வினாக்கள்)

ஆயாதி – பதவின்யாசம் – மண்பரிசோ தனை – அஸ்திவாரம் – அளவைகள் – சாந்தார – நிரந்தார விமானங்கள் – சாந்திகம் முதலான விமான உயர்நிர்ணயம், பிரகாரலட்சணம், பரிவாரலட்சணம், மண்டபலட்சணம், கோபுரலட்சணம் – மரபுசார்ந்த கட்டடக்கலை நூல்கள் – சாதி சந்த விகல்ப ஆலயங்கள் – உபபீடம், அதிட்டானம், பாதம், பிரஸ்தரம், கண்டம், சிகரம், ஸ்தூபி, சூம்பலதா, விருத்தஸ்புடிதம், கோஷ்டபஞ்சரம் – தோரணம் – கருவறை – அர்தமண்டபம் – முகமண்டபம் – சுற்றுபிராகாரமண்டபம் – வாகனமண்டபம் – துவஜஸ்தம்பம் – பலிபீடம் – தேர் – குளம், விமானம் மற்றும் கோபுரங்களின் உயர்நிர்ணய அளவீடுகள் (1 முதல் 13 தளங்கள் வரை) சிற்பத்துறை அளவைகள் – படிமவகைகள் – அறுவகைமானங்கள் – தாளமானங்கள் – தெய்வத்திருமேனி உயர்நிர்ணயம் – பங்க இலக்கணம் – ஆடை ஆபரணங்கள் – தலைக்கோலங்கள் – கைமுத்திரைகள் – ஆசனங்கள் – ஆயுதங்கள் மற்றும் லிங்கத்திருமேணிகள், 32 கண்பதிகள் – 16 சுப்ரமணியர்கள் – 16 சிவமூர்த்தங்கள் – சப்தமாதர்கள்

சக்திதிருமேனிகள் - சப்ததாண்டவம் - 63 நாயன்மார்கள் - அஷ்டதிக்கபாலகர்கள் தச அவதாரப் படிமங்கள் விஷ்ணுவின் நின்ற, அமர்ந்த மற்றும் கிடந்த திருக்கோலங்கள் - யோகம், போகம், வீரம் ஆபிசாரிக வகைகள் - 12 ஆழ்வார்கள் - கருட மற்றும் ஆஞ்சநேயர் இலட்சணம். உலோகப் படிமங்களின் முக்கியத்துவம் - உற்சவப்பேரம்பலிபேரம், ஸ்நபணபேரம், கௌதுகபேரம் - செப்புத்திருமேனிகளின் அளவு முறைகள் - கருக்கட்டுதல் - உலோககலவை முறைகள்- வார்ப்பு செய்தல் - உலோகப் படிமங்களை பாதுகாத்தல் மற்றும் பராமரித்தல்.

அலகு II: கட்டுமான பொறியியல் (20 வினாக்கள்)

கட்டுமானப் பொருட்களின் தரம் மற்றும் உறுதித்தன்மை (Strength of Materials), கட்டமைப்பின் இயக்கவியல் (Mechanics of Structure), அழுக்கம் மற்றும் இழுவிசை (Simple stress and strain), பொருண்மைத் தன்மைகளின் பொறியியல் தோற்றம் (geometrical properties of section), உத்திரங்கள் மற்றும் வளைவுகள் (Beams and bending), தூண்கள் மற்றும் கமாண்கள் (columns all Struts, Arches) - கட்டுமான வரைவு மற்றும் வரைபடம் (Structural Design Drawing), கட்டுமான பொறியியல் (Structural Engineering), இருபுற சுவர் மேல்வருகின்ற வலுவூக்கிய சிமெண்ட்கற்காரை உத்திரம் (Simply supported reinforced beam), ஒருவழிபலகை (one way slab), Sheer and bend, இருவழி வலுவூக்கிய சிமெண்ட்கற்காரை உத்திரம் (Doubly Reinforced Beam), இருவழிபலகை (Two way slabs), டி-வடிவ உத்திரம் (T beam), தூண்கீழ் அடுக்கு (Column footing), கட்டமைப்புகளின் கோட்பாடு (Theory of structures), மேன்மைப்படுத்தப்பட்ட சிமெண்ட்கற்காரை (Advanced RCC), ஒருங்கிணைந்த இணைப்பு மற்றும் நேரடியான அழுக்குவிசை (Combined Bonding and Direct Stress), முன்அழுத்தப்பட்ட சிமெண்ட்கற்காரை (Prestressed concrete), மறுவடிவமைக்கப்பட்ட கம்பிகள் (Deformed bars), அளக்கையியல் (Quantity survey), மதிப்பீடு மற்றும் விலைவிவரம் (Estimate and costing).

அலகு III: இந்திய சமயங்கள் மற்றும் தத்துவம் (10 வினாக்கள்)

இந்திய சமயங்களின் தோற்றம், வளர்ச்சி மற்றும் கொள்கைகள் - சைவம், வைணவம், சாக்தம், காணாபத்தியம், கௌமாரம், சௌரம், ஜைனம் மற்றும் பௌத்தம் - சமயக் கொள்கைகள் - கிராமதேவதைகள். இந்தியத்தத்துவம் - வேதம் - சமயக் கொள்கை, சடங்குகள் மற்றும் தத்துவ விளக்கம் - உபநிடதங்களின் மையக்கருத்து, பிரம்மம், ஆத்மா மற்றும் பிரபஞ்சவிளக்கம் - கடவுள்கொள்கை - நியாய, வைசேசிக பிரமாணங்கள், சாங்கிய, யோகம், பிரகிருதி - புருஷன் - பிரபஞ்சத்தின் தோற்றக்கொள்கை - வேதாந்தம் - அத்வைதம், துவைதம், விசிஷ்டாத்வைதம் - சைவசித்தாந்த கொள்கை விளக்கம்.

அலகு IV: இந்திய கோயில் கட்டடக்கலை மற்றும் சிற்பக்கலை வரலாறு (15 வினாக்கள்)

பண்டையகால சிற்பங்கள் மற்றும் கட்டடங்களின் தோற்றம் - சிந்து சமவெளி நாகரிக கட்டுமானங்கள் மற்றும் சிற்பங்கள் - முத்திரைகள் - சித்திர எழுத்துக்கள் - வேதகால கட்டடக்கலை - மௌரியகால பௌத்த கட்டடக்கலை மற்றும் சிற்பக்கலை - சுங்க, சாதவாகனர்கால கலைகள் - குப்தர்கால கட்டுமானக் கோயில்கள் மற்றும் சிற்பங்கள் - சாளுக்கியர்கால குடைவரைக்கோயில் மற்றும் கட்டுமானக்கோயில்கள் - இராஷ்டிரசூடகால கோயில் மற்றும் சிற்பங்கள் - கலிங்க கட்டடக்கலை மற்றும் சிற்பக்கலையின் தனித்துவம் - ஒய்சாளர் வரலாறும், அவர்களது கலை பங்களிப்பும்.

அலகு V: தமிழக கோயில் கட்டடக்கலை மற்றும் சிற்பக்கலை வரலாறு (20 வினாக்கள்)

சங்ககால கட்டடக்கலை, பல்லவர்காலம், முற்காலபாண்டியர், சோழர் - விஜயநகரர் - நாயக்கர், 19ம் நூற்றாண்டு கோயில்கள் சங்ககால கட்டடக்கலை - (சாளுவாண்குப்பம்) - பல்லவர்கால குடைவரைகள் - ஒற்றைகல்தளிகள், கட்டுமானக்கோயில்கள், முற்கால பாண்டியர்களின் குடைவரைகள், வெட்டுத்தளி, கட்டுத்தளிகள் - முத்தரையர், வேளிர், பழுவேட்டரையர், முற்காலசோழர் - சோழர்கள் - பிற்காலசோழர்கள் - பிற்கால பாண்டியர்கள் - மண்டபங்கள் - கோபுரங்கள் - விஜயநகரகாலம் - நாயக்கர்காலம். முக்கிய கோயில்களின் அடிப்படை அமைப்புகள் - மாமல்லபுரம் கடற்கரைக்கோயில், காஞ்சிகைலாசநாதர் கோயில், பனமலை தாளகிரீஸ்வரர் கோயில், நார்த்தாமலை விஜயாலயசோழீஸ்வரர் தஞ்சைபெரியகோயில், மதுரை மீனாட்சியம்மன் கோயில், திருவரங்கம், திருவண்ணாமலை, திருவில்லிபுத்தூர், தமிழர்களின் கட்டடக்கலையின் தனித்துவம் - நாகர, திராவிட, வேசரம் சார்ந்த கட்டடக்கலை ஒப்பீடு - பூம்புகார், சாலுவாண்குப்பம் கட்டுமானங்கள். தமிழர்களின் தொன்மை வழிபாடு - கிராம தேவதைகளின் தோற்றம் - நடுகல்சிற்பங்கள் - மாரியம்மன் - இசக்கி அம்மன், ஐய்யனார், கருப்பசாமி, மாடசாமி, பேச்சி அம்மன், முனீஸ்வரன், பெரியாண்டவர் - நாகவழிபாடு - புற்றுவழிபாடு, சப்தகண்ணிகள் வழிபாடு, அண்ணன்மார் வழிபாடு

அலகு VI: தொல்லியல் - கல்வெட்டியல் மற்றும் பராமரிப்பு முறைகள் (15 வினாக்கள்)

தொல்லியலின் உட்பிரிவுகள் - கல்வெட்டியல், நாணயவியல், மேற்பரப்புகள் ஆய்வு, அகழாய்வு, ஆழ்கடல் அகழாய்வு, அருங்காட்சியங்கள், கலைச்சின்னங்கள் பராமரிப்பு முறைகள் மற்றும் சட்டங்கள் யுனெஸ்கோ பாரம்பரிய சின்னங்கள் - நெறிமுறைகள் - கல்வெட்டுகளின் வகைகள், செப்பேடுகள் - எழுத்துக்களின்

வகைகள், தமிழி, வட்டெழுத்து, தமிழ், கிரந்தம் - நாகரி - எழுத்துக்கள் மற்றும் அவற்றின் காலம் மற்றும் வளர்ச்சி - கல்வெட்டுக்களின் முக்கியத்துவம் - படியெடுக்கும் முறை மற்றும் பாதுகாப்பு - புணரமைப்பின் போது கல்வெட்டுகளை பாதுகாப்பதின் நோக்கம் மற்றும் முக்கியத்துவம்.

அலகு VII: கோயில் நிர்வாகமும் இந்துசமய அறநிலையத்துறை சட்டங்களும் (20 வினாக்கள்)

சமயம், சமூகம், பொருளாதாரம், கலை, கல்வி, மருத்துவம், நீதி, நிர்வாகம் இவற்றுக்கான மையமாக திகழும் கோயில்கள் குறித்து விளக்கம். முற்காலத்தில் கோயில் நிர்வாகத்தை மேற்கொண்ட ஊர், சபை, வணிகக் குழுக்கள், சித்திரமேழி போன்ற நிர்வாக அமைப்புகள்

பூநூதர், பூநீமகேஸ்வரர், பூநீவைஷ்ணவர், தேவகன்மி, கணக்கர் இவர்கள் மேற்கொண்ட கோயில் நிர்வாகம் தானம் மற்றும் இதர ஆதாரங்கள் மூலமாக பெறும் வருவாய்கள் தானம் மூலமாக பெறப்படும் நிலங்கள் மற்றும் விலைக்கு வாங்குதல் - உரிமை மாற்றம் நிலவிற்பனைகள் கோயில்கள் கருவூலம் - வட்டிக்கு பணம் வழங்குதல் போன்ற வங்கி செயல்பாடுகள், கோயில்களுக்கு தானமாக வழங்கப்பட்ட கால்நடைகளை பராமரித்தல் மற்றும் அதன் மூலமாக பெறப்படும் வருவாய்கள் - நெய், பால்பொருட்களை கோயில்நிர்வாகம் அபிவேகம் மற்றும் தீபத்திற்காக பயன்படுத்துதல். குற்றச்செயல்களுக்கு தானமாக பெறப்படும் பொருட்களை நிர்வகித்தல் கோயில் பணியாளர்களின் பணிகள் மற்றும் அவர்களின் ஊதியத்தை நிர்ணயித்தல் பாளையக்காரர்கள் மற்றும் பாடிக்காவலர்களின் நிர்வாகமுறை ஆங்கிலேயர் காலத்தில் கோயில்நிர்வாகம் - பரம்பரை மற்றும் தேர்ந்தெடுக்கப்பட்ட கோயில் நிர்வாகபணிகள் - தேவஸ்தானம், தேவசம் நிர்வாகம் - கோயில் நிர்வாகச் சட்டங்கள் - இந்துசமய அறநிலைய சட்டங்கள் மற்றும் சிறப்பு சட்டங்கள் - திருப்பதி தேவஸ்தானம் போன்றவை. அரசு நிர்வகிக்கும் இந்துசமய அறநிலையத்துறை நிர்வாகம்.

அலகு VIII: கட்டுமானநிர்வாகம் (20 வினாக்கள்)

திட்டமிடுதலும் நிர்வகித்தலும்
கட்டுமான திட்டமிடல்
கட்டுமான ஒப்பந்தம்
ஒப்பந்தபுள்ளியும் ஒப்பந்த அறிவிக்கையும்
கட்டுமான செயலாக்கம்
பணிக்கான தொகையை வழங்குதல்
இருப்பு கிடங்கு
பணியாளர் மற்றும் தொழிற்சூட நிர்வாகம்
வங்கி கணக்குகளை பராமரித்தல்

அலகு IX: கோயில்பராமரிப்பு (25 வினாக்கள்)

வரையறை - நோக்கம் - நெறிமுறைகள் - தொன்மைத்தன்மை மாறாமல் அதன்அசல் தன்மையோடு பாதுகாத்தலின் நெறிமுறைகள் - சீரமைப்பும், புனர்நிர்மானம் ஆகியவற்றின் நோக்கமும் தேவையும் கல்கட்டுமானங்களில் ஏற்படும் சிதைவுகள், விரிசல்கள் ஆகியவற்றினை சரிசெய்தல் - இதற்கான நுட்பங்கள் கட்டுமானபொருட்களின் அடிப்படையில் பாதுகாத்தல், சீரமைத்தல் மற்றும் புனர்நிர்மானம் (கல் - செங்கல் - மரம் - உலோகம்) இயற்கை மற்றும் பேரிடர்களால் அஸ்திவாரங்களில் ஏற்படும் பாதிப்புகளை சரிசெய்தல் - ஈரப்பதத்தினால் சுவர்களில் ஏற்படும் பாதிப்புகளை சரிசெய்தல் - இந்துசமய அறநிலையத் துறையின் பாதுகாப்பு நெறிமுறைகள் உப்பு அரிப்பு மற்றும் கட்டிடங்களில் வளரும் செடிகளை அகற்றும் முறைகள்

அலகு X: ஆகமங்கள் மற்றும் தமிழ்இலக்கியங்களில் கோயில் கட்டிடக்கலை குறித்த குறிப்புகள் (25 வினாக்கள்)

சைவாகமம் - 28 சைவாகமங்கள் தோற்றமும் வளர்ச்சியும் - வேதம் மற்றும் ஆகமம் - உபநிடதம் மற்றும் ஆகமம் - ஆகமம் மற்றும் சமய ஆச்சாரியார்கள் - ஆகமத்தின் உட்பிரிவுகள் - ஆகமத்தின் முக்கியத்துவம் - ஆகமம் மற்றும் சைவசிந்தாந்த விளக்கம் - ஆகமங்கள் கோயில்களை திட்டமிடுதலும் நடைமுறைப்படுத்துதலும் - காயிகாமத்தில் கட்டிடக்கலை குறிப்புகள் - வாதுளாகமம், ரௌரத்ர ஆகமங்களில் கட்டிடக்கலை வைணவ ஆகமங்கள் வைகாணச மற்றும் பாஞ்சராத்ர ஆகமங்களில் கோயில் கட்டிடக்கலை குறித்த குறிப்புகள் - வைணவ ஆகமங்கள் தோற்றமும் வளர்ச்சியும் - ஆகமத்தின் உட்பிரிவுகள் - ஆகமங்களின் முக்கியத்துவம் - விஷ்ணுவின் 10 அவதாரங்களின் விளக்கம் - வைணவத்தில் குடமுழுக்கு - வைணவ ஆகமங்களில் கோயில் கட்டிடக்கலை - மரீச்சிசம்ஹிதை - பாத்மசம்ஹிதை - அத்ரிசம்ஹிதை - பிரகத்சம்ஹிதை இவைகளில் கட்டிடக்கலை மற்றும் சிற்பக்கலை விளக்கம் - சுப்ரபேதாகமம் - விமானார்ச்சனகல்பம் - குமாரதந்திரம் ஆகியவற்றில் கட்டிடக்கலை.

தமிழ் இலக்கியங்களில் கட்டிடக்கலை
கம்பராமாயணம் - நகரபடலம் (பாடல்எண். 7-13, 19, 23-30)
கலிங்கத்துபரணி - 4 கோயில் பாடியது (பாடல்எண். 1-11)

நெடுநல்வாடை (வரி 72-130)

மதுரைக்காஞ்சி (வரி 351-356)

பட்டினப்பாலை (வரி 142-145, 261-264, 285-287)

சிந்தாமணி - காந்தருவதத்தையார் இலம்பகம் (பாடல் 590-595)

தணிகைபுராணம் - அகத்தியர் அருள்பெறும் படலம் (பாடல் 64-79)

தேவாரத்தில் அப்பர் பாசுரங்கள்

பெரியபுராணம் - பூசலார்நாயனார்

பரிபாடல்

சிலப்பதிகாரம் - குன்றக்குரவை, வேட்டுவவரி, அரங்கேற்றக்காதை (அடியார்க்குநல்லார் உரை)

30. Translation (Descriptive Type) (Degree Standard)

Code: 462

Translation of the following from English to Tamil:

- State Acts, Bills, Ordinances, Rules and Notifications made thereunder. (145 Marks)
- Central Acts, Ordinances, Rules and Notifications made thereunder. (105 Marks)
- Legal Terms / Legal Maxims. (50 Marks)

31. Translation and Precis Writing (Degree Standard) (Descriptive Type)

Code: 099

Translation English to Tamil

Section - A (120 Marks)

- 1) An official letter in English pertaining to Government correspondence or a Government Order (G.O.) (60 Marks)

The Letter or G.O. should not exceed 400 words. All technical terms and unfamiliar phrases are to be explained in a simple manner in an accompanying key in the question paper.

- 2) A 400 word editorial or an inspiring speech or a newspaper report can be given for translation from English to Tamil (60 Marks)

a) Controversial topics like politics, religion, sex, or any other topic that would trigger controversy should be avoided.

b) Technical terms and unfamiliar phrases are to be explained in English in a simple manner in an accompanying key in the Question Paper.

Section -B

Translation: Tamil to English (120 Marks)

- 1) An official letter in Tamil pertaining to Government correspondence or a Government Order (G.O.). The letter or G.O. Should not exceed 200 words (60 Marks)

- 2) A 200 - Word editorial or an inspiring speech or a newspaper report can be given for translation from Tamil to English (60 Marks)

a) Controversial topics like politics, religion, sex or any other topic that would trigger controversy should be avoided.

Section- C

Precis Writing in Tamil (30 Marks)

A 600- word essay or a passage in Tamil dealing with science, technology, sociology, geography, Psychology, history or literature taken from any non-controversial source. Controversial topics like politics, religion, sex and communal aspects must be avoided.

Section–D

Precis Writing in English (30 Marks)

A 600 word passage in English dealing with science, technology, sociology, geography, psychology, history or literature taken from any non-controversial source. Controversial topics like politics, religion, sex and communal aspects must be avoided. Technical terms and unfamiliar phrases are to be explained in English in a simple manner in an accompanying key in the question paper.

32. Travel and Tourism (Degree Standard)

Code: 353

Unit I: Principles and Practices of Tourism (15 Questions)

Introduction to Tourism – Meaning and Scope, Concept, Components and types of Tourism – Evolution of Tourism in India - Emerging Trends – Ministry of Tourism, Government of India – Department of Tourism, Government of Tamil Nadu.

Unit II: Tourism Products of India (30 Questions)

Unique features of Tourism Products – Tourist attractions - Hills / Beaches / Mountains / Water Bodies – Forts / Palaces / Fairs and Festivals / Folk Dances / Dance / Music - Art and Crafts – Temples / Churches / Mosque and other religious worship places – UNESCO World Heritage Sites – Flora and Fauna – Major wildlife Sanctuaries and National Parks – Major Tourist Circuits of India – Land, Air and Water based adventure activities, Guidelines and Regulations – Ancient Monuments Preservation Act, 1904 – Ancient Monuments and Archaeological Site and Remains Act, 1958.

Unit III: Transport (20 Questions)

History – Land – Water and Air – Growth of Road Transport – Indian Road Network – Major Rail Network of India – Types of Rail Tours in India – Water Transport – History and Development – Historical Past – Cruise Ships – Ferries – Hovercraft – River and Canal Boats – Boat Houses - Air Industry / Airlines in India / Functions/ Present policies – Air Charters.

Unit IV: Accommodation Operations (20 Questions)

Origin and growth of hotels – Classification of Accommodation / Hotels on the basis of Size, Location, Facilities, Plan, Service and Ownership – Allied Catering Services – Supplementary Accommodation House Keeping – Front Office Management – Booking Procedures – Types of Food and Beverages.

Unit V: Tourism Marketing (20 Questions)

Unique features of Tourism Marketing – Market Segmentation – Marketing mix – Tourists behavior – Distribution channel and its characteristics – Market research – Market forecast – Marketing Promotions – Tools of Promotion – E-Marketing – Domestic and International Travel Marts – Branding of Tourism Products – “Incredible India” Campaign – “Enchanting Tamil Nadu: Experience Yourselves” – Swachh Bharat Abhiyan – Destination Life Cycle.

Unit VI: Tourism Policy and Planning (25 Questions)

Need and Objectives of Tourism Policy – John Sargent Committee – L.K.Jha Committee (Adhoc Committee), 1963 - National Tourism Policy, 1982 - Yunus Committee, 1988 – Tourism Finance Corporation of India – National Action Plan on Tourism, 1992 – National Tourism Policy-2002 – Tourism in Five Year Plans – Tamil Nadu Tourism Policy.

Unit VII: Functions of Travel Agency and Tour Operation (20 Questions)

Tour Operation Procedures – Tour Package – Itinerary Preparation – Tour Costing – Travel Formalities – Passport / VISA / Health Regulations / Travel Insurance / Customs Clearance / Foreign Exchange formalities – Baggage Rules.

Unit VIII: Tourism Geography (25 Questions)

Physical Geography of India – Climate Sub-Continent - River System – Mountains – Plains – Political Geography of India – World Time Zone, GMT – India Time Zone.

Unit IX: Tourism Organisations (15 Questions)

Organisation and Functions of WTO, ICAO, IATA, PATA, TAAI, IH&RA, SIHRA, FHRAI, NTO.

Unit X: Impact of Tourism (10 Questions)

Positive and Negative – Socio-Cultural and Economic Impact – Physical / Environment Impact: Earth Summits.

**33. Town Planning, Civil Engineering and Architecture
(Degree Standard)****Code: 560****Unit I: Introduction to Planning - Theory and Techniques (20 Questions)**

Planning System in India, Regional Plan, Master Plan, Structure Plan, Detailed Development Plans, City Corporate Plan and Smart City Plan - Concept of Region, Types of Region, Techniques of Regional Analysis. Multi-level Planning - Process of evolution of human settlement planning - Simulation models, Gravity analysis, Lowry model, Threshold analysis, Multivariate analysis – Optimization and economic analysis methods in project formulation and implementation.

Unit II: Urban Sociology, Economics, Geography and Environment - Theories and Applications (20 Questions)

Ecological processes and structures in Indian Cities - Social Change & Economic Development - Agglomeration economics - Economics of scale, Multiplier effect concept, scope, limitation - Basic and non-basic activities of economics base, methods of base identification - Land-use determinants, Locational Dynamics of urban Land-use - Spatial organization of Urban settlements - City-region, Urban Sprawl and Fringe - Urbanization in India and Tamil Nadu with reference to settlements and population distribution. Environmental Impact Assessment Practice in India - Types, Conceptual Approach and Phases of EIA – Environmental Concepts – Sustainable Planning – Eco Cities, Compact Cities, Smart growth, Sponge city.

Unit III: Remote Sensing, G.I.S. and Current Trends in Planning (20 Questions)

Basics of Remote Sensing and GIS. - Classification of spatial and non - spatial data application in planning - spatial data layers - Coding schemes – Digitization of spatial data – Editing spatial data usable for the given planning problem – Land use Suitability Analysis, Land use Modeling, Existing Land use Preparation using Mobiles, Satellite Imageries, Aerial Photographs, Drones in Physical Planning. Emerging Concepts of sustainable urban development, E – Governance, HRIDAY, Rurban Mission, AMRUT, Public private partnership, Local bodies and urban finance. Land Pooling concept, Transfer of Development Right, Accommodation Reservation, Formulation of Re-development and Urban Expansion Plans - Local Area Plans, Town Planning Schemes - Special Economic Zone, Value Capture Finance Policy Framework – Swiss Challenge Model, Industrial Corridor, Coastal Zone Management Plan, Planned Unit Development.

Unit IV: Physical Infrastructure and Legislation (20 Questions)

Implication of Urban Form and Size on Services Highway classification - Traffic and Transportation Survey - Para Transit modes – Private transport – Urban Transportation Planning Process – Trip Generation – Trip Distribution – Modal Split – Trip Assignment, Congestion pricing, Non Motorized Transport, Transit Oriented Development, Bus Rapid Transit System, Unified Transport Authority. Tamil Nadu Urban Local Bodies Act, 1996 and Tamil Nadu Urban Local Bodies Rules, 2023. 73rd and 74th Constitutional Amendment Act (CAA) and their implications on planning and development. Town and Country Planning Act of Tamil Nadu 1971, Tamil Nadu Combined Development and Building Rules 2019, Urban and Regional Development Plans Formulation and Implementation (URDPFI) and Rural Area Development Plans Formulation and Implementation (RADPFI).

Unit V: Design of Reinforced Concrete, Pre stressed Concrete and Steel Structures (20 Questions)

Design of concrete members - limit state and working stress design concepts - design of slabs - one way, two way and flat slabs - Design of singly and doubly reinforced sections and flanged sections - design of columns and footings – pre- stressing - systems and methods- post tensioning slabs - Design of pre-stressed members for flexure.

Design of tension and compression members - Design of bolted and welded connections design of members of truss - designs of columns and bases - design of beams, plate girders and gantry girder- design of liquid storage structures –elevated and underground- design of retaining wall.

Unit VI: Environmental Engineering and Pollution Control (20 Questions)

Sources of water - Water Demand -- Characteristics and analysis of water – hydraulics for conveyance and transmission - water borne diseases – Functional design of water treatment plant – desalination plant- water distribution system – pipe network analysis- characteristics and composition of sewage - Planning and design of sewerage system - sewer appurtenances - Pumping of sewage - sewage treatment and disposal - Design of storm water drain- plumbing system in high rise building - industrial waste treatment - solid waste management – Air and Noise pollution control – E-Waste management.

Unit VII: Urban and Transportation Engineering (20 Questions)

Urbanization trend and impact - Slum clearance and slum improvement programmes - Different modes of transport and their characteristics. Geometric design of highways. – Pavement materials and testing – alternate pavement materials- modified binders - Design and Construction of bituminous and concrete roads – pavement distress and evaluation - Maintenance of roads – Railways - Components of permanent way - Signalling, Interlocking and train control - drainage in roads and railways. Airport planning - Components of Airport - Site selection – Runways – Planning of terminal buildings Harbours & Ports - Layout of a harbour - Docks - Breakwaters.

Unit VIII: Introduction to Architecture (20 Questions)

Definition of Architecture - Integration of aesthetics and function. Elements of Architecture – Form, Space, light, colour, etc. Principles of Architecture – Proportion, Scale, balance, rhythm, symmetry, hierarchy, pattern and axis. Understanding of organization of form and space, volumetric study, architectural characteristics & style of buildings with examples. Understanding user circulation and spatial requirement for all types of buildings. Universal design principles and Barrier free environment. Functional aspects of architecture – site, structure, skin, circulation etc. Principles of composition and relationship between human activities and anthropometrics. Modern Architecture - various philosophies, works of postmodern architects. Architecture of India under Colonial rule. Post-independence architecture in India - works of Indian Architects. Contemporary World Architecture & recent trends. Building Rules and Regulations, National Building Code.

Unit IX: Site Planning, Climatic Design and Energy Efficient Architecture (20 Questions)

Site Planning – Introduction to basic terminologies, Methods of surveying, Instruments & Application, Levelling, Site Drawings, Importance of Site Analysis – On-site & off-site factors, Study of micro climate, Site Diagramming, Site Context, Site planning & Site layout principles. Organization of spaces – circulation, built form and open spaces, site planning and micro climate, site planning for neighborhood parks, children’s play area and campus development – Landscaping of Functional areas – Urban open spaces and principle of urban landscape – Street landscaping, landscape design for waterfront areas and functional areas in urban centers – green roofs and walls. Climate & Human comfort, Visual and Acoustical comfort in built environment. Solar Control, Heat flow through materials & building envelope design, Air movement patterns through natural & built forms, Design strategies for different climate types. Energy Efficiency – Importance & Significance, Passive Heating & Cooling techniques, case studies, day Lighting & Natural ventilation, Use of Renewable energy systems – Current & future trends. National and state level government organizations -initiatives, schemes and projects. Relevant National and state level legislations and guidelines.

Unit X: Human Settlements Planning and Urban Studies (20 Questions)

Origin of Human settlements In India & the rest of the world – River valley civilizations (Indus Valley, Mesopotamia, Egyptian & Chinese) – Traditional planning principles in India – approaches & concepts – Classical & Medieval planning in Europe and India - Evolution of modern planning theory, concepts and works of town planners; Contemporary Urban planning – Issues and Trends. Urban Design – need, aspects, scope & components of urban space – Indian Urbanism - Theorising & Reading urban space – Imageability & townscape elements, social aspects of urban space, gender & class. Urban Public spaces – Universal design, pedestrian friendly environment, streetscapes. Conservation in India – Understanding the need & purpose, definition, Adaptive re- use, International agencies & their role – Policies & legislations, case studies – Conservation practice and Planning.

Annexure IV

Instructions to be followed by the candidates

1. Written Examination

1.1. Reporting Time at the Examination Venue

1.1.1. To facilitate verification of the identity of the candidates and explanation of the procedures related to the examination, the candidates shall present themselves at the examination venue one hour before the time scheduled for the commencement of the examination.

1.1.2. All gates serving as entry into the examination venue shall be closed thirty minutes before the commencement of the examination. After that, no candidate shall be permitted to enter the premises of the examination venue.

1.1.3. In case of examinations to be held in both forenoon and afternoon sessions, the reporting time for the afternoon session shall also be thirty minutes before the commencement of the examination and no one shall be allowed into the venue thereafter.

1.2. Entry into the Examination Venue

1.2.1. Candidates shall present themselves at the examination venue with the memorandum of admission (hall ticket) downloaded from the Commission's website, failing which, they shall not be allowed to write the examination. Candidates shall also bring with them, a photocopy of their Aadhaar card / Passport / Driving Licence / Permanent Account Number (PAN) card / Voter ID card as identity proof.

1.2.2. Candidates must appear for the examination at the venue they have been allotted, as mentioned in the memorandum of admission (hall ticket). Change of venue will not be permitted. No candidate, without prior approval, shall be allowed to appear for the examination at a venue other than the one originally allotted.

1.2.3. Candidates may be subjected to frisking at the examination venue, if required, with the assistance of male/female police personnel or any authorized persons, as the case may be.

1.2.4. Parents and others who accompany the candidates will not be permitted inside the examination venue.

1.3. Memorandum of Admission (Hall Ticket)

1.3.1. If the photograph of the candidate in the memorandum of admission is not printed or not clear or does not match with candidate's appearance, he/she should furnish a separate photograph affixed on a plain paper, along with his name, address, register number and signature along with a copy of the memorandum of admission (hall ticket) and a copy of Aadhaar card / Passport / Driving Licence / Permanent Account Number (PAN) card / Voter ID card, to the Chief Invigilator, who shall countersign it. The identity proof in original, should also be shown to the room invigilator for verification. The room invigilator upon verification of the identity of the candidate, shall obtain an undertaking as to the genuineness of the candidate and to the effect that he/she is aware that he/she is liable to any criminal/penal action initiated by the Commission, if the information furnished is found to be incorrect at a later date. The undertaking shall then be handed over to the Chief Invigilator.

1.3.2. Candidates must show the memorandum of admission to the Invigilator / Chief Invigilator / inspection authorities / any authorized persons of the examination hall, on demand for verification.

1.3.3. The memorandum of admission should be preserved carefully and retained permanently. The memorandum of admission should be produced if shortlisted for the next stage of selection / whenever sought by the Commission. The memorandum of admission may also be photocopied, as a precaution, after the examination is over. No duplicate memorandum of admission will be issued later.

1.4. Examination Room

1.4.1. The candidates shall compulsorily be seated in the examination room thirty minutes before the time scheduled for the commencement of the examination.

1.4.2. Candidate must sit in the place allotted after checking the name, register number and photo as pasted on the table

1.4.3. Water, tea, coffee, snacks, soft drinks, etc., will not be allowed inside the examination room.

1.4.4. Candidates should maintain strict discipline not only in the examination room but also inside the campus of the examination venue. Candidates found smoking / intoxicated or found to have entered into a quarrel of any kind, or to have misbehaved with the Chief Invigilator or with the inspection authorities or with the invigilator or with any other candidate either in the examination hall or inside the campus of the examination venue, either before, during or after the examination, are liable to invalidation of answer sheet and debarment for any period the Commission may deem fit, as well as appropriate criminal action.

1.4.5. Candidates suffering from serious health issues, may, with the consent of the Chief Invigilator, deposit medication or other medical requirements on the room invigilator's table for use if needed.

1.4.6. In case of extraordinary circumstances, like pandemic conditions, etc., the procedures / precautions prescribed (e.g., use of sanitizer and face mask, practicing social distancing) shall be adhered to.

1.5. Alarm Bell

An alarm bell shall be sounded in respect of each of the following activities to alert the candidates. The room invigilators shall make appropriate announcements as and when required.

Event	Timeline	Duration of Bell
Before Commencement of Examination		
Objective type Examination: Distribution of OMR answer sheets	30 minutes before	Short Bell (2 seconds)
Descriptive type Examination: Distribution of Question-cum-Answer Booklets	15 minutes before	Short Bell (2 seconds)
At the Start and During the Examination		
Commencement of the Examination	At the Designated Time	Long Bell (5 seconds)
During the Examination	Every One Hour	Short Bell (2 seconds)
Before Conclusion of the Examination	10 minutes before conclusion	Short Bell (2 seconds)
At the Conclusion of the Examination		
Conclusion of the Examination	At the Designated Time	Long Bell (5 seconds)

1.6. Instructions for the Objective Type Examination (OMR)

1.6.1. Candidates must carry only black ink ball point pen, a photocopy of any one proof of ID, as specified and memorandum of admission (hall ticket) inside the examination room. Other materials are not allowed.

1.6.2. OMR Answer Sheet

1.6.2.1. The pre-printed personalized OMR answer sheets containing photograph, name, register number, subject, examination centre and venue, date and session as mentioned in the memorandum of admission (hall ticket) will be distributed thirty minutes before the time scheduled for the commencement of the objective type examination.

1.6.2.2. Before using the OMR answer sheet, the photograph and the details printed on it shall be verified by the candidates. It shall be ensured that the OMR answer sheet pertains to the candidate only. If any of the details are found to be incorrect or defective in any way, it should be immediately reported to the room invigilator for replacement. No OMR answer sheet will be replaced after use.

1.6.2.3. Candidates shall darken the question booklet number and answers in the OMR answer sheet, as per the correct method specified below;

சரியான முறை / CORRECT METHOD	தவறான முறை / WRONG METHOD (மதிப்பெண் வழங்கப்படாது) (No mark will be awarded)
1. ● B C D E	1. A B C D E 2. A B C D E 3. A B C D E 4. A B C D E 5. A ● C D E 6. A B C D E

1.6.2.4. The candidate must write and darken the Question Booklet Number which is used by him / her correctly in the bubbles provided in the OMR answer sheet. The question booklet number darkened by the candidate is final. The OMR answer sheets will be evaluated based on the Question Booklet Number darkened by the candidates in the bubbles. The correct method of darkening Question Booklet Number is illustrated below. For example, if the Question Booklet Number is 1234

(I) வினாத்தாள் தொகுப்பு எண் / QUESTION BOOKLET NUMBER:
தங்களுக்கு வழங்கப்பட்ட வினாத்தாளில் அச்சிடப்பட்டுள்ள வினாத்தாள் தொகுப்பு எண்ணினை கீழேயுள்ள கட்டங்களில் கருமை நிற மையுடைய பந்துமுனைப் பேனாவினால் சரியாக எழுதி, அதன் கீழே உள்ள சரியான வட்டத்தை கருமையாக்கவும்.

Write the Question Booklet Number printed in the Question Booklet supplied to you in the Boxes given below and darken the corresponding Bubbles with Black ink ball point Pen only.

1	2	3	4
●	①	①	①
②	●	②	②
③	③	●	③
④	④	④	●

தேர்வரால் கருமையாக்கப்பட்ட வினாத்தாள் தொகுப்பு எண்ணை இறுதியானது சரியாக கருமையாக்கப்படாத நிலையில், OMR விடைத்தாள் செல்லாததாகக் கருதப்படும்.
The Question Booklet Number darkened by the candidate is final. If not correctly darkened, the OMR answer sheet will be INVALIDATED.

1.6.2.5. Candidates must darken only one of the answer bubbles in the OMR answer sheet, for each question. In case more than one bubble is darkened for a particular question, that answer shall not be evaluated.

1.6.2.6. Candidates should darken in the respective answer bubble for all the 200 questions. Option [E] should be darkened if the answer is not known to the candidate. If the candidates darkened the respective answer bubble for all 200 questions, they should darken the circle "Yes". If not darkened the respective answer bubble for one or more questions i.e., left blank, they should darken the circle "No". The candidates should write the total number of questions not darkened in the specified box, as below;

(IV) 200 வினாக்களுக்கும் அது தொடர்பான விடைக்குரிய வட்டத்தை கருமையாக்கி விட்டீர்களா ? Have you darkened the respective answer bubble for all 200 questions? இல்லை எனில், கருமையாக்கப்படாத வினாக்களின் மொத்த எண்ணிக்கையை எழுதவும். If 'No', write the total Number of Questions not darkened	ஆம் / இல்லை Yes / No <input type="radio"/> <input type="radio"/>
	<input type="text"/>

1.6.2.7. Candidates shall affix their signature at the designated place in the OMR answer sheet.

(II) தேர்வரின் உறுதிமொழி / Declaration of the Candidate:
OMR விடைத்தாளின் பக்கம் -2ல் உள்ள அறிவுரைகளை படித்து அறிந்து கொண்டேன். மேலும், OMR விடைத்தாளில் உள்ள அனைத்து விவரங்களும் (கருமையாக்கப்பட்ட வினாத்தாள் தொகுப்பு எண் உட்பட) என்னால் சரிபார்க்கப்பட்டது.
I have read and understood the Instructions at Page-2 of this OMR answer sheet. Further, all the contents in this OMR answer sheet (including Question Booklet Number darkened) are verified by me.

தேர்வரின் கையொப்பம்
SIGNATURE OF THE CANDIDATE
(தேர்வர் கையொப்பமிடவில்லையெனில், விடைத்தாள் செல்லாததாகப்படும்)
(Answer sheet will be invalidated, if Not Signed by the Candidate)

1.6.2.8. Candidates shall affix his / her left hand thumb impression at the designated place in the OMR answer sheet.

இடது கை பெருவிரல் ரேகை பதியவில்லையெனில் தேர்வர் பெறும் மொத்த மதிப்பெண்களிலிருந்து 0.5 மதிப்பெண் குறைக்கப்படும்.
0.5 mark will be deducted from total marks obtained by the candidate for not affixing Left Hand Thumb Impression.
(V) தேர்வரின் இடதுகை பெருவிரல் ரேகை மட்டும்.
Candidate's Left Hand Thumb Impression only.

1.6.2.9. The room invigilator should darken the respective bubble in Column IA with black ink ball point pen, for the following details;

(I A) TO BE DARKENED BY THE INVIGILATOR (with Black ink Ballpoint pen)		
(a) Candidate's signature available in the space provided	YES <input type="radio"/>	NO <input type="radio"/>
(b) Candidate's Left Hand Thumb Impression available in the space provided	YES <input type="radio"/>	NO <input type="radio"/>

1.6.3. Question Booklet

1.6.3.1. The question booklet will be distributed fifteen minutes before the time scheduled for the commencement of the examination.

1.6.3.2. Before writing and darkening the Question Booklet Number in the OMR answer sheet, the candidate shall verify whether all the questions are printed without any omission. In case any defect is found, it shall immediately be reported to the Room Invigilator and a replacement shall be obtained which is complete in all aspects. If any defect is noticed in the question booklet after the commencement of the examination, it will not be replaced.

1.6.3.3. Candidates must not tick mark / mark the answers in the question booklet. Failure to comply with this instruction will result in rejection of candidature.

1.6.4. Attendance Sheet: After checking the OMR answer sheet and the question booklet for discrepancies, candidates must sign in the attendance sheet, after verifying his / her name and register number therein, duly mentioning the question booklet number.

1.6.5. The video regarding the instructions to candidates appearing for the objective type examination is available in <https://tnpsc.gov.in/English/omr-guidelines.html> .

1.7. Computer Based Test (CBT) Examination

1.7.1. The Registration for the examination shall start one hour before the time scheduled for the commencement of the examination.

1.7.2. Each candidate will be assigned a Computer to take up the examination.

1.7.3. No computer knowledge is required to take up the Computer Based Test. Knowledge in Mouse operation would suffice to take up the Computer Based Test.

1.7.4. Candidates will be provided with a user name and password to login the system.

1.7.5. Use the keyboard only to key-in the Register Number, User id (registration id) and password.

1.7.6. Necessary instructions will be displayed on the screen. Kindly read all the instructions carefully and follow the instructions without fail.

1.7.7. Questions with five options each will be displayed in the computer screen.

1.7.8. One question will be displayed on the screen at a time.

1.7.9. The questions will appear on the screen in ascending order, which can be answered one by one.

1.7.10. Candidate can use only the mouse to select the correct answers and proceed with answering the questions.

1.7.11. To select your answer of a question, click on the button of one of the options.

1.7.12. Click on Save and Next button after answering every question to save your answer. Otherwise your answer will not be saved.

1.7.13. To deselect your chosen answer, click on the button of the chosen option again or click on the Clear Response button.

1.7.14. Candidates can proceed to the next question by clicking next button or previous question by clicking

previous button.

1.7.15. Candidates can recheck his / her answers and if he / she feels to correct the answers, it can be done at any time before the closure of examination. They can skip the questions also, if they desire so.

1.7.16. Candidate can submit their answers at any time during the examination.

1.7.17. Once the entire answers are submitted, the candidates have no option to proceed further.

1.7.18. If the candidates fail to submit their answers, the system will automatically submit the answers to the server, at the closure of the examination.

1.7.19. The question and answers can be zoomed to the required level for the candidates with visual impairment.

1.7.20. Instruction for enlarging images, to view the image provided in the question in a bigger size, click on the image and rotate the scrolling wheel on the mouse.

1.7.21. Question Number Box: Question Number Box displayed on the right side of the screen will show the status of each question using one of the following symbols:

 1 You have not visited the question yet.

 2 You have not answered the question.

 3 You have answered the question.

 4 You have NOT answered the question, but have marked the question for review.

 5 You have answered the question and marked for review. This will be considered for evaluation.

The 'Marked for Review' status for a question simply indicates that you would like to look at that question again.

You can click on the ">" arrow which appears to the left of question number box to minimize the question number box. This will enable you to view the question on a bigger area of the screen. To view the question number box again, you can click on "<" arrow which appears on the right side of the screen.

You can click on  to navigate to the bottom and  to navigate to the top of the question area, without scrolling. The summary of number of questions answered, not answered, not visited, marked for review and answered and marked for review will be displayed above the question number box.

1.7.22. Time available for the candidate to complete the examination will be displayed through a countdown timer in the top right-hand corner of the screen. It will display the remaining time as Time Left. (For example: if duration of examination is 3 hours, at the beginning of exam, timer will show 180 minutes and for Differently Abled candidates with scribe / without scribe 240 minutes, which will reduce gradually with passage of time). When the timer reaches zero, the examination will end by itself and the examination will be submitted by the system automatically.

1.7.23. Candidates will be provided with a paper for doing rough work. After closure of the examination, rough sheet will be collected.

1.7.24. Candidates have to sign the attendance sheet and affix thumb impression for verification of his / her identity.

1.7.25. The Examination Hall will be under camera surveillance.

1.7.26. Any attempt of malpractice found, will render you liable to such penal action as the Commission may decide.

1.7.27. In case of doubt in the questions and answers, English version is the final.

1.7.28. To acquaint with the operation of Mouse and the CBT, the candidates can take up the mock test available in the Commission's website (www.tnpsc.gov.in) and they can practice the usage of mouse in the mock test. Mock test is similar to the CBT to be held on the day of examination. In the Mock test, all the steps are given similar to the CBT. Candidates can practice the mock test as many times as he / she likes.

1.8. Instructions for the Descriptive Type Examination

1.8.1. Candidates must carry only black ink pen (Fountain pen or Ball point pen or Gel pen), a photocopy of any one proof of ID, as specified and memorandum of admission (hall ticket) inside the examination room. Other materials are not allowed.

1.8.2. The question-cum-answer booklet as well as instructions regarding filling up of the same, shall be given fifteen minutes before the time scheduled for the commencement of the examination.

1.8.3. Candidates shall write answers in the question-cum-answer booklet.

1.8.4. Candidates must sign in the attendance sheet, after verifying his/her name and register number therein, duly mentioning the question-cum-answer booklet number.

1.8.5. In cases where the question number and the answer written therein or the question and answer written therein do not correspond to each other or the candidate makes any modification in the question number, such an answer shall not be evaluated.

1.8.6. If an answer booklet of a candidate for one paper is declared deemed not fit for valuation, the answer booklets of the candidate for the remaining papers will also be treated as invalid / not subjected for evaluation.

1.8.7. In case of doubt in the questions, English version is the final.

1.8.8. Borrowing of any material, instruments from other candidates is strictly prohibited. Candidates shall use only their own pens and specifically permitted material.

1.8.9. Candidates shall not be allowed to exceed the time allotted for answering the paper, for any reason.

1.8.10. Candidates should appear for all the papers in the examination for his / her answers to be evaluated and in case the candidate absents himself / herself for any of the papers, the papers attended will not be evaluated.

1.9. Other Instructions for the Written Examination

1.9.1. No candidate will be allowed to leave the examination hall until the closure of the examination.

1.9.2. The candidates are instructed to cooperate with the videographer and display clear visuals of his/her face and Register Number either on table or through Hall Ticket as and when the videographer comes to the table for taking visuals.

1.9.3. Requests from candidates for furnishing answer paper copy before the completion of the entire selection process, will not be entertained by the Commission.

1.9.4. After conclusion of the entire selection process, copies of OMR answer sheet / descriptive type

answer booklet shall be made available to the candidates on the Commission's website. On requisite payment, the candidates can download the answer papers.

1.10. Instructions for Usage of scribe and Compensatory Time

1.10.1. Candidates with Disability

1.10.1.1. Candidates with disability, shall be permitted to utilize the services of a scribe upon making such request in the online application subject to the following conditions. Request for scribe made after the submission of application or on the date of examination will receive no attention.

1.10.1.2. For the candidate with disability as defined under section 2(s) of the Rights of Persons with Disability Act, 2016, the facility of scribe and/or compensatory time shall be granted solely to those having difficulty in writing subject to uploading of a certificate to the effect that person concerned has limitation to write, including that of speed and that scribe is essential to write examination on his/her behalf from the Medical Board as per the format available in Annexure II . Compensatory time of not less than 20 minutes per hour of examination will be allowed to candidates with disability, who have physical limitation to write including that of speed and who are utilizing the services of a scribe. The candidate with disability should upload the Certificate of Disability in the format prescribed in Annexure II and the Certificate from the Medical Board in the format available in Annexure V at the time of submission of online application.

1.10.2. Candidates with Benchmark Disability

1.10.2.1. Candidates with benchmark disability, shall be permitted to utilize the services of a scribe / compensatory time upon making such request in the online application subject to the following conditions. Request for scribe / compensatory time made after the submission of application or on the date of examination will receive no attention.

1.10.2.2. Candidate with benchmark disability as defined under section 2(r) of the Rights of Persons with Disability Act, 2016, in the category of blindness, locomotor disability (both arm affected) and cerebral palsy, the facility of scribe shall be given, if so desired by the candidate. Compensatory time of not less than 20 minutes per hour of examination will be allowed to candidates with blindness, locomotor disability (both arm affected) and cerebral palsy and who are utilizing the services of a scribe. The candidates with benchmark disability in the category of blindness, locomotor disability (both arm affected) and cerebral palsy should upload the Certificate of Disability in the format prescribed in Annexure II, at the time of submission of online application.

1.10.2.3. In case of other category of benchmark disability, the provision of scribe can be allowed on uploading of a certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution, to the effect that person concerned has limitation to write, including that of speed and that scribe is essential to write examination on his/her behalf. Compensatory time of not less than 20 minutes per hour of examination will be allowed to candidates with other category of benchmark disability and who are utilizing the services of a scribe. The format of the certificate is available in Annexure II. The candidates with other category of benchmark disability should upload the Certificate of Disability in the format prescribed in Annexure II and the Certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution in the format available in the Annexure V, at the time of submission of online application.

1.10.2.4. All candidates with benchmark disability who have physical limitation with regard to writing including that of speed and not availing the services of a scribe will be allowed additional time of a minimum of one hour for an examination of three hours duration, on production of a certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution, to the effect that person concerned has limitation to write and compensatory time is recommended. Such candidates with benchmark disability should upload the Certificate of Disability in the format prescribed in Annexure II and the Certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution in the format available in Annexure V at the time of submission of online application.

1.10.3. The Commission will arrange for scribes and the fee amount to be paid to the scribes will be met by the Commission. Candidates availing of the services of the scribes need not pay any fee to them.

1.10.4. All candidates with disability, availing of the services of the scribes while appearing for the written examination will be seated in a separate room in the ground floor, in close vicinity to the Chief Invigilator's control room and under the close supervision of the Chief Invigilator.

1.11. Special Instructions for the Candidates with Benchmark Disabilities

1.11.1. Candidates with benchmark disability must affix their signature and left hand thumb impression in the space provided in the answer sheets, if possible. Candidates with locomotor disability and visual impairment who have been permitted to use scribe facility, who are unable to affix their signature, may affix their left hand thumb impression alone. Candidates who are unable to use their left hand, must affix right hand thumb impression. Candidates who are unable to use both hands, and who have been permitted to use scribe, may leave the signature and thumb impression columns blank.

1.11.2. All persons with benchmark disability, who are unable to climb the staircase, will be allowed to write the examination in a room in the ground floor, in close vicinity to the Chief Invigilator's control room.

1.12. Penalty for Violation of Commission's Instructions

The answer sheets of the candidate will be invalidated / marks deducted / criminal action initiated / and debarment imposed for the following violations:

1.12.1. Invalidation of Answer Sheet in Objective Type Examination

1.12.1.1. Usage of pen other than black ink ball point pen.

1.12.1.2. Making any irrelevant or impertinent remarks / symbols.

1.12.1.3. If the candidate has not signed in the space provided at page 1 of the OMR answer sheet.

1.12.1.4. If the Question Booklet Number printed in the Question Booklet supplied to the candidate is not darkened correctly in the OMR answer Sheet / or even if one or more bubble(s) of Question Booklet Number is left blank (not darkened) in the OMR answer sheet.

1.12.2. Invalidation of Answer Booklet in Descriptive Type Examination

1.12.2.1. Usage of pens other than black ink pens. The candidate shall use the same black ink pen (Fountain pen or Ball point pen or Gel pen) in the entire answer booklet for all purposes including writing the register number, signing on the first page, answering, drawing, underlining, highlighting, striking off unused space in the answer booklet, striking off answers in excess of the number required, etc. For this purpose, candidates should keep sufficient number of additional black ink pens of same type, with same colour and shade of ink.

1.12.2.2. Usage of whitener, sketch pens, pencil, colour pencils, multicolour pens, crayons or any other writing materials, for any purpose.

1.12.2.3. Writing religious symbols, writing their name, signature, phone number, cell phone number, initials, address and writing any other name, initial or address in the answer booklet except in the manner instructed in the question-cum-answer booklet.

1.12.2.4. Appealing to the examiner in the answer booklet, invoking sympathy of examiners in connection with their results.

1.12.2.5. Candidates writing anything unconnected to the question, or any impertinent remarks and irrelevant matter revealing his / her identity.

1.12.2.6. Writing the answers in more than one language (i.e., partly in Tamil and partly in English) except in cases where specifically permitted. If the candidates answer in Tamil, they should write the entire examination in Tamil only or if the candidates answer in English, they should write the entire examination in English only. However, technical words which cannot be translated, can be written in the respective languages, i.e., only the technical words and not the entire sentence / entire answers. The answer booklet of the candidate who violates this instruction will be invalidated.

1.12.2.7. Wrongly seated in the place of other candidates and/or written the examination using the answer booklet of other candidates.

1.12.2.8. Tampering with the Barcode printed on the question-cum-answer booklet.

1.12.2.9. The question-cum-answer booklet has not been signed by the candidates in the designated places.

1.12.3. Deduction of Marks for Objective Type Examination

1.12.3.1. If none of the respective answer bubble is darkened for any of the question, (i.e., if left blank) 0.5 mark will be deducted from the total marks obtained by the candidate.

1.12.3.2. If Left Hand Thumb Impression is not affixed at the space provided at page 1 of the OMR answer sheet, 0.5 mark will be deducted from the total marks obtained by the candidate.

1.12.4. Criminal Action: Criminal action will be initiated against the candidates for the following reasons.

1.12.4.1. Misbehaviour and indiscipline in the examination hall: Candidates should maintain strict discipline not only in the examination room, but also inside the campus of the examination venue. Candidates found smoking / intoxicated, or found to have entered into a quarrel of any kind, or to have misbehaved with the Chief Invigilator or with the inspection authorities or with the invigilator or with any other candidate either in the examination hall or inside the campus of the examination venue, either before, during or after the examination, are liable to invalidation of Answer sheet and debarment for any period the Commission may deem fit, as well as appropriate criminal action.

1.12.4.2. Indulging in any type of malpractice, including impersonation and resorting to unfair means within the examination hall or outside will lead to debarment for any period deemed fit by the Commission, besides initiation of criminal action.

1.12.4.3. Invalidation of Answer sheet / Question-Cum-Answer Booklet as well as debarment for such period as the Commission may deem fit will be imposed on candidates resorting to any kind of irregularity or malpractice within / outside the examination hall including:

- a. Consulting with / copying from another candidate in the examination hall.
- b. Permitting others to copy from his/her Answer Sheet / Question-cum-Answer Booklet
- c. Copying from books or notes which are printed / typewritten / handwritten.
- d. Seeking the help / assistance of any official / hall supervisor in answering questions in examination hall.
- e. Approaching or attempting to approach an examiner or getting other people to approach an examiner on his behalf.
- f. Possession of electronic devices such as cellular phones, watches with inbuilt memory note, and rings with in-built memory notes, Bluetooth devices, communication chip, other electronic devices and non-electronic devices such as P&G design data book, books, notes, handbags, other non-permitted materials, etc.
- g. Taking away from the examination hall, the whole or part of any used / unused Answer Sheet /

Question-cum-Answer Booklet without handing it over to the room invigilator.

h. Tampering with the Barcode printed on the Answer Sheet / Question-cum-Answer Booklet.

1.12.4.4. Violation of any one or more of the instructions contained in the Commission's Instructions to Applicants, instructions mentioned in the Notification, instructions printed on the memorandum of admission (hall ticket) shall also make the candidate liable to debarment, either permanently or for such period as the Commission deems fit, and/or rejection of candidature after due process and /or any other penalty, as decided by the Commission.

1.12.5. Debarment

The period for which candidates shall be debarred from appearing for the examinations / participating in the recruitment processes conducted by the Commission, for the offences committed by the candidates are given below. Besides debarment, the candidate shall also be liable to rejection of candidature after due process, invalidation of answer sheet, as the case may be. Criminal action may also be initiated against such candidates wherever indicated.

S. No	Nature of Offence	Period of Debarment
1	Attempts to influence the Chairman, Members of the Commission, Secretary, Controller of Examinations or any officer or staff of the Commission, personally / by letter / through relatives, friends, patrons, officials or other persons.	Three Years
2	Production of bogus community / destitute widow / differently abled / ex-serviceman / transgender / person studied in Tamil medium certificates, etc. Tampering or alteration in the documents or certificates.	Permanent, Initiation of criminal action
3	Suppression of material information, at any stage of the selection process, regarding: (i) Previous appearances or availing free chances. (ii) Regular / temporary employment in Government or Quasi-Government organizations, local bodies, public sector undertakings, statutory bodies, public corporations, Universities, etc., (iii) Criminal cases, arrests, convictions, disciplinary proceedings, etc. (iv) Debarment or disqualification by Union Public Service Commission / State Public Service Commissions / other agencies	One Year
4	Possession of electronic devices such as cellular phones, watches with in-built memory notes and rings with in-built memory notes, Bluetooth devices, communication chip, any other electronic devices inside the examination room and also seeking the help of / assistance of any official / invigilator / any outsider in answering question	Permanent
5	Possession of non-electronic devices such as P&G Design Data Book, books, notes, guides, handbags, other non-permitted materials, etc. inside the examination room.	Three Years
6	Consulting with other candidates, copying from other candidates, permitting others to copy from his / her answer paper, copying from books or notes which are printed / typewritten / hand written, etc.	Three Years
7	In addition to the offences listed herein, the involvement of candidates in any indiscipline or irregular practices within / outside the examination room.	Three Years
8	Written certain unwarranted remarks unconnected with answers to the subject concerned in the answer books, etc., i.e., vulgar, derogatory and obscene language.	Three Years

9	Appeal to the examiners in the answer books, to value liberally or to award more marks or to be sympathetic, etc.	One Year
10	Approaching or attempting to approach an examiner or getting other people to approach an examiner on his / her behalf	Permanent, Initiation of criminal action
11	Taking away from the examination hall, the whole or part of any used / unused question-cum-answer booklet, without handing it over to the room invigilator. Tampering with the Barcode.	Three Years
12	Candidates found smoking / intoxicated, or found to have entered into a quarrel of any kind, or to have misbehaved with the Chief Invigilator or with the inspection authorities or with the invigilator or with any other candidate either in the examination hall or inside the campus of the examination venue, either before, during or after the examination.	Three Years
13	Indulging in grave malpractices, including impersonation, amounting to subversion of the conduct of examination.	Permanent, Initiation of criminal action

2. Answer Key Challenge for Objective Type Examination

2.1. Tentative answer keys will be hosted in the Commission's website within twenty working days from the date of conduct of examination. Instructions available in the Para 17 D (iv) of Instructions to Applicants are not applicable to this recruitment. Candidates can challenge the tentative answer keys through the 'Answer Key Challenge' window available in the Commission's website (www.tnpsc.gov.in) [Recruitment → Answer Keys]. Representations, if any, challenging the tentative answer keys shall be submitted only through online mode within seven days from the date of publication of tentative answer keys. Representations received by post or e-mail will receive no attention.

2.2. Detailed instructions, procedures to challenge the tentative answer keys have been made available in the Commission's website. Representations made online/offline after the closure of the window will also receive no attention.

2.3. The challenges submitted on time, through the online mode, shall be referred to a committee comprising of experts in each subject. The decision on the final answer key shall be made, based on the recommendations of the expert committee and answer sheet evaluation shall commence thereafter.

2.4. The Commission shall not publish the final answer key until the completion of the entire selection process.

3. Onscreen Certificate Verification

3.1. Onscreen Certificate Verification will be done based on the documents already uploaded by the candidate at the time of online application.

3.2. Based on the onscreen certificate verification, the candidates will be given 10 calendar days to upload the required document(s) / defective document(s) or certificate(s). Failure to re-upload the required document(s) / defective document(s) or certificate(s) as per the claim in the online application within the time stipulated by the Commission, shall result in rejection of claim.

4. Physical Certificate Verification

4.1. Candidates admitted to physical certificate verification shall produce all the original certificates uploaded / re-uploaded (if applicable) for physical certificate verification as claimed in the online application, without fail.

4.2. After verification of original certificates, the eligible candidates alone will be admitted for counselling. If the candidate does not satisfy the eligibility criteria, his/her online application will be rejected and his/her provisional admission to physical certificate verification will be cancelled and will not be allowed to attend the counselling.

4.3. If the candidate does not appear for the physical certificate verification on the scheduled date and time, the candidate will not be given any further chance to appear for the physical certificate verification and will not be allowed to attend the counselling.

5. Counselling

5.1. Candidates will be allowed to participate in the counselling based on his / her rank. If the candidate does not appear for the counselling on the scheduled date and time, the candidate will not be given any further chance to appear for the counselling.

5.2. The post chosen by the candidate during the counselling cannot be changed under any circumstances.

Annexure V

1. Form for Certificate for Allocation of Scribe / Compensatory Time

This is to certify that I have examined Mr/Ms/Mrs. _____ (Name of the candidate with disability) a person with _____ (Nature and percentage of disability as mentioned in the certificate of disability), S/o/D/o _____ a resident of _____ (Village / District / State and to state that He / She has physical limitation which hampers his / her writing capabilities owing to his / her disability).

Due to the above mentioned disability following concession may be given:- *

1. Allocation of a scribe.
2. Compensatory time for writing the examination.

*strike out the non applicable.

Signature

(Name of Government Hospital / Civil Surgeon / Medical Superintendent / Signature of the notified Medical Authority of a Government Health Care Institution / Medical Board)

Name & Designation

Name of Government Hospital / Health Care Centre / The notified Medical Authority/ Medical Board

Place:

Date:

Signature / Thumb impression
of the Differently Abled Person

(Photo of the
Differently
Able Person
and Stamp to
be fixed here)

Note:

Certificate should be given by a specialist of the relevant stream / disability

(e.g. Visual Impairment – Ophthalmologist, Locomotor disability – Orthopedic Specialist / PMR etc.,)

2. Form for Eye Fitness Certificate

1. Name		
2. Father's Name		
3. Visual standard without glasses	Right Eye	Left Eye
a. Distant Vision (without glasses)		
b. Near Vision (without glasses)		
4. Field Vision		
5. Color Vision		
6. Fundus appearance		
7. Whether suffering from colour blindness? (Yes / No)		
8. Standard Vision		
Date :	Signature of the Specialist in Ophthalmology : Name : Designation : Seal :	
Note: Colour blindness is a disqualification for the posts of Agricultural Officer (Extension) (Post Code.1678), Assistant Engineer (Civil) (Post Code.3663), Research Assistant (Post Code.1861), Computer-cum-Vaccine Store Keeper (Post Code.3201) and Junior Scientific Officer (Post Code.1767)		

3. Certificate from the Head of Institution/ University

Photograph of
the candidate
with the
signature of
the authorised
signatory

This is to certify that Thiru/Tmt/Selvi. _____ son/ daughter of Thiru/Tmt. _____ bearing Register no. _____, completed the _____ course during the academic year _____ to _____ in our Institution/University. He/ she has successfully completed all the requirements of the course/program and results for all subjects were declared on _____

Office Seal:

Date:

Signature (with Seal) of the
Authorised Signatory of the Institution/
University
(Controller of Examinations/ Principal/
Dean/ Registrar)

Annexure VI

Sl. No.	Post	Post Code	Department / Organization	Unit / District / Division / State	Category	Vacancies	Total
1	Agricultural Officer (Extension)	1678	Agriculture	State	GT (G)	2	8
					GT (W)	1	
					BC(OBCM) (G)	1	
					BC(OBCM) (W)	1	
					MBC/DC (G) (PSTM)	1	
					SC (G)	1	
					ST (G) (LV)	1	
					Total	8	
2	Assistant Director (Industrial Safety And Health)	1664	Industrial Safety and Health	State	BC(OBCM) (G) (PSTM)	1	1
					Total	1	
3	Assistant Engineer	1661	Highways	State	GT (G)	16	92
					GT (G) (PSTM)	4	
					GT (G) (HH)	1	
					GT (W)	5	
					GT (W) (PSTM)	2	
					GT (W) (HH)	1	
					BC(OBCM) (G)	12	
					BC(OBCM) (G) (PSTM)	4	
					BC(OBCM) (G) (HH)	1	
					BC(OBCM) (W)	4	
					BC(OBCM) (W) (PSTM)	3	
					BC(M) (G)	3	
					BC(M) (W)	1	
					MBC/DC (G)	10	
					MBC/DC (G) (PSTM)	2	
					MBC/DC (W)	5	
					MBC/DC (W) (PSTM)	1	
					SC(A) (G)	2	
					SC (G)	7	
					SC (G) (PSTM)	2	
					SC (G) (HH)	1	
					SC (W)	3	
					SC (W) (PSTM)	1	
ST (G) (PSTM)	1						
Total	92						
4	Assistant Engineer	1660	Rural Development and Panchayat Raj	State	GT (G)	7	41
					GT (G) (PSTM)	2	
					GT (W)	3	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	5	
					BC(OBCM) (G) (PSTM)	2	
					BC(OBCM) (G) (HH)	1	
					BC(OBCM) (W)	3	
					BC(M) (G)	1	
					BC(M) (W)	1	

					MBC/DC (G)	4	
					MBC/DC (G) (PSTM)	2	
					MBC/DC (W)	1	
					MBC/DC (W) (PSTM)	1	
					SC(A) (G)	1	
					SC (G)	2	
					SC (G) (PSTM)	1	
					SC (G) (HH)	1	
					SC (W)	1	
					SC (W) (PSTM)	1	
					Total	41	
5	Assistant Engineer	3269	Tamil Nadu Pollution Control Board	State	BL_MBC/DC (G) (LV)	1	38
					GT (G)	7	
					GT (G) (PSTM)	1	
					GT (W)	2	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	2	
					BC(OBCM) (G) (PSTM)	2	
					BC(OBCM) (G) (HH)	1	
					BC(OBCM) (W)	2	
					BC(OBCM) (W) (PSTM)	1	
					BC(M) (G)	1	
					MBC/DC (G)	4	
					MBC/DC (G) (PSTM)	2	
					MBC/DC (W)	2	
					SC(A) (G) (PSTM)	1	
					SC (G)	4	
					SC (G) (PSTM)	1	
					SC (W)	2	
					ST (W) (PSTM)	1	
					Total	38	
6	Assistant Engineer (Agriculture Engineering)	1667	Agriculture Engineering	State	GT (G)	19	116
					GT (G) (PSTM)	5	
					GT (G) (LV)	1	
					GT (G) (HH/HI)	1	
					GT (W)	9	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	16	
					BC(OBCM) (G) (PSTM)	4	
					BC(OBCM) (G) (LD/LC/DF/AC)	1	
					BC(OBCM) (W)	8	
					BC(OBCM) (W) (PSTM)	1	
					BC(M) (G)	3	
					BC(M) (G) (PSTM)	1	
					BC(M) (W) (PSTM)	1	
					MBC/DC (G)	14	
					MBC/DC (G) (PSTM)	3	
					MBC/DC (W)	4	
					MBC/DC (W) (PSTM)	2	
					SC(A) (G)	1	
					SC(A) (G) (PSTM)	1	
					SC(A) (W)	1	

					SC (G)	8	
					SC (G) (PSTM)	4	
					SC (G) (LV)	1	
					SC (W)	4	
					SC (W) (PSTM)	1	
					ST (G)	1	
					Total	116	
7	Assistant Engineer (Civil)	3232	Chennai Metropolitan Development Authority	State	GT (G)	1	3
					MBC/DC (G)	1	
					SC(A) (G) (PSTM)	1	
					Total	3	
8	Assistant Engineer (Civil)	3603	Hindu Religious and Charitable Endowments	State	GT (G)	6	39
					GT (G) (PSTM)	2	
					GT (W)	3	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	7	
					BC(OBCM) (G) (PSTM)	1	
					BC(OBCM) (W)	3	
					MBC/DC (G)	5	
					MBC/DC (G) (PSTM)	1	
					MBC/DC (W)	2	
					SC(A) (G) (PSTM)	1	
					SC(A) (W) (PSTM)	1	
					SC (G)	3	
					SC (G) (PSTM)	1	
					SC (W)	2	
					Total	39	
9	Assistant Engineer (Civil)	3368	State Industries Promotion Corporation of Tamil Nadu Limited	State	GT (G)	4	17
					GT (G) (PSTM)	1	
					GT (W)	1	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	2	
					BC(OBCM) (W)	1	
					BC(M) (W)	1	
					MBC/DC (G)	3	
					SC(A) (G) (PSTM)	1	
					SC (G)	1	
					SC (W)	1	
					Total	17	
10	Assistant Engineer (Civil)	3531	Tamil Nadu Housing Board	State	GT (G)	2	9
					GT (W)	1	
					BC(OBCM) (G)	2	
					BC(OBCM) (W) (PSTM)	1	
					MBC/DC (G)	1	
					MBC/DC (G) (PSTM)	1	
					SC (W) (PSTM)	1	
					Total	9	
11	Assistant Engineer (Civil)	3663	Tamil Nadu Maritime Board	State	MBC/DC (W)	1	2
					SC (G)	1	
					Total	2	
12	Assistant Engineer (Civil)	3270	Tamil Nadu Water Supply and Drainage Board	State	BL_GT (G) (SLD)	1	1
					Total	1	

13	Assistant Engineer (Civil)	1656	Water Resources	State	GT (G)	8	38
					GT (G) (PSTM)	1	
					GT (W)	3	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	5	
					BC(OBCM) (G) (PSTM)	1	
					BC(OBCM) (G) (LD(OA,OL)DF/AC)	1	
					BC(OBCM) (W)	1	
					BC(OBCM) (W) (PSTM)	2	
					BC(M) (G)	1	
					BC(M) (W)	1	
					MBC/DC (G)	4	
					MBC/DC (G) (PSTM)	1	
					MBC/DC (W)	1	
					MBC/DC (W) (PSTM)	1	
					SC(A) (G)	1	
					SC (G)	2	
					SC (G) (HH)	1	
					SC (W)	2	
Total	38						
14	Assistant Engineer (Electrical)	3678	Chennai Metropolitan Development Authority	State	GT (G)	1	1
					Total	1	
15	Assistant Engineer (Electrical)	3532	Tamil Nadu Housing Board	State	GT (W)	1	1
					Total	1	
16	Assistant Engineer (Electrical)	3610	Tamil Nadu Magnesite Limited	State	GT (G)	1	1
					Total	1	
17	Assistant Engineer (Mechanical)	3611	Tamil Nadu Magnesite Limited	State	GT (G)	1	3
					MBC/DC (G)	1	
					SC(A) (W) (PSTM)	1	
					Total	3	
18	Assistant Manager (Mines)	3274	Tamil Nadu Minerals Limited	State	GT (G)	4	12
					GT (W)	1	
					BC(OBCM) (G)	1	
					BC(OBCM) (W)	1	
					MBC/DC (G)	1	
					MBC/DC (W)	1	
					SC(A) (G) (PSTM)	1	
					SC (G) (PSTM)	1	
					SC (W)	1	
					Total	12	
19	Assistant Section Officer (Translation)	2069	Tamil Development and Information	State	GT (G) (LV)	1	5
					BC(OBCM) (G)	1	
					MBC/DC (W)	1	
					SC (G) (PSTM)	1	
					SF_SC (G)	1	
					Total	5	

20	Assistant Statistical Investigator	1824	Economics and Statistics	State	GT (G)	2	33
					GT (G) (PSTM)	2	
					GT (G) (ASD/ID/SLD/MI/MD)	1	
					GT (G) (EXSER)	1	
					GT (W)	1	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	4	
					BC(OBCM) (G) (PSTM)	1	
					BC(OBCM) (W)	2	
					BC(OBCM) (W) (PSTM)	1	
					BC(M) (G)	1	
					MBC/DC (G)	4	
					MBC/DC (W)	2	
					SC(A) (G) (PSTM)	1	
					SC (G)	3	
					SC (W) (PSTM)	1	
					SF_SC (G)	1	
					SF_ST (G)	4	
					Total	33	
21	Assistant Sthapathi	3527	Hindu Religious and Charitable Endowments	State	GT (G)	6	38
					GT (G) (PSTM)	2	
					GT (W)	3	
					BC(OBCM) (G)	7	
					BC(OBCM) (G) (PSTM)	1	
					BC(OBCM) (W)	3	
					MBC/DC (G)	5	
					MBC/DC (G) (PSTM)	1	
					MBC/DC (W)	2	
					SC(A) (G) (PSTM)	1	
					SC(A) (W) (PSTM)	1	
					SC (G)	3	
					SC (G) (PSTM)	1	
					SC (W)	2	
Total	38						
22	Assistant Superintendent of Vigilance Institutions	2086	Children Welfare and Special Services	State	SF_SC (G)	1	1
					Total	1	
23	Assistant Tourist Officer, Grade II	3111	Tourism	State	GT (G)	1	4
					MBC/DC (G)	1	
					SC (W)	1	
					ST (G) (PSTM)	1	
					Total	4	
24	Community Officer	3701	Tamil Nadu Urban Habitat Development Board	State	GT (G)	1	15
					GT (G) (PSTM)	1	
					GT (G) (LV/VI)	1	
					GT (W)	1	
					BC(OBCM) (G)	2	
					BC(OBCM) (G) (PSTM)	1	
					BC(OBCM) (W)	1	
					BC(M) (G)	1	

					MBC/DC (G)	1	
					MBC/DC (G) (PSTM)	1	
					MBC/DC (W)	1	
					SC (G)	1	
					SC (G) (PSTM)	1	
					SC (W)	1	
					Total	15	
25	Computer Programmer	3605	Tamil Nadu Urban Finance and Infrastructure Development Corporation Limited	State	GT (G)	1	1
					Total	1	
26	Computer-Cum-Vaccine Store-Keeper	3201	Public Health and Preventive Medicine	State	BC(OBCM) (G) (PSTM)	1	1
					Total	1	
27	Environmental Scientist	3606	Tamil Nadu Pollution Control Board	State	GT (G)	3	14
					GT (G) (PSTM)	1	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	2	
					BC(OBCM) (G) (LV)	1	
					BC(OBCM) (W)	1	
					MBC/DC (G)	1	
					MBC/DC (G) (PSTM)	1	
					MBC/DC (W)	1	
					SC (G)	1	
					SC (W)	1	
					Total	14	
28	Executive Officer, Grade - I	1653	Hindu Religious and Charitable Endowments	State	GT (G)	1	5
					BC(OBCM) (G) (PSTM)	1	
					MBC/DC (G)	1	
					MBC/DC (W)	1	
					SC (W) (PSTM)	1	
					Total	5	
29	Executive (P&A)	3604	Tamil Nadu Cements Corporation Limited	State	SF_ST (G)	1	1
					Total	1	
30	Inspector of Fisheries	1759	Fisheries and Fishermen Welfare	State	BL_BC(OBCM) (G) (LC/DF)	1	3
					BC(OBCM) (G)	1	
					MBC/DC (G)	1	
					Total	3	
31	Junior Chemist	3609	Tamil Nadu Magnesite Limited	State	GT (G)	1	3
					MBC/DC (G)	1	
					SC(A) (DW) (PSTM)	1	
					Total	3	
32	Junior Electrical Inspector	1666	Electrical Inspectorate	State	GT (G)	1	2
					BC(OBCM) (G)	1	
					Total	2	

33	Junior Manager (Finance And Accounts)	3352	Tamil Nadu Urban Finance and Infrastructure Development Corporation Limited	State	BC(OBCM) (G)	1	1
					Total	1	
34	Junior Manager (Personnel Administration)	3613	Tamil Nadu Urban Finance and Infrastructure Development Corporation Limited	State	BC(OBCM) (G)	1	1
					Total	1	
35	Junior Manager (Technical)	3608	Tamil Nadu Power Finance and Infrastructure Development Corporation Limited	State	GT (G)	1	1
					Total	1	
36	Junior Planner	3602	Chennai Metropolitan Development Authority	State	GT (G)	6	30
					GT (G) (PSTM)	1	
					GT (W)	2	
					GT (W) (PSTM)	1	
					BC(OBCM) (G)	4	
					BC(OBCM) (G) (PSTM)	1	
					BC(OBCM) (W)	1	
					BC(OBCM) (W) (PSTM)	1	
					BC(M) (W)	1	
					MBC/DC (G)	5	
					MBC/DC (W)	1	
					SC(A) (G) (PSTM)	1	
					SC (G)	2	
					SC (W)	2	
ST (G) (PSTM)	1						
Total	30						
37	Junior Scientific Officer	1767	Forensic Science	State	GT (G)	2	9
					GT (W)	1	
					BC(OBCM) (G)	1	
					BC(OBCM) (W) (PSTM)	1	
					MBC/DC (G)	2	
					SC (G)	1	
					SC (W) (PSTM)	1	
Total	9						
38	Librarian	1854	State Council of Educational Research and Training	State	GT (G)	1	1
					Total	1	
39	Librarian Grade II	3607	Tamil Nadu Pollution Control Board	State	GT (G)	1	2
					SC(A) (DW) (PSTM)	1	
					Total	2	
40	Mining Engineer	3612	Tamil Nadu Magnesite Limited	State	GT (G)	1	1
					Total	1	

41	Project Officer	3614	Tamil Nadu Minerals Limited	State	GT (G)	1	3
					MBC/DC (G)	1	
					SC(A) (W) (PSTM)	1	
					Total	3	
42	Research Assistant	1861	Evaluation and Applied Research	State	SC (W)	1	1
					Total	1	
43	Senior Accountant	3702	Tamil Nadu Minerals Limited	State	GT (G)	1	4
					GT (G) (PSTM)	1	
					BC(OBCM) (G)	1	
					SC (W)	1	
					Total	4	
44	Statistical Assistant	3125	Food Safety and Drug Administration	State	MBC/DC (G)	1	1
					Total	1	
45	Statistical Inspector	1697	Animal Husbandry and Veterinary Services	State	MBC/DC (G)	1	1
					Total	1	
46	System Manager	3664	Civil Supplies and Consumer Protection	State	GT (G)	2	9
					GT (W)	1	
					BC(OBCM) (G)	1	
					BC(OBCM) (W)	1	
					MBC/DC (G)	1	
					MBC/DC (W)	1	
					SC(A) (W) (PSTM)	1	
					SC (G)	1	
					Total	9	
47	Translator (Tamil Cell)	3106	Law	State	SC (G)	1	1
					Total	1	
					Grand Total	615	