



# UTTAR PRADESH PUBLIC SERVICE COMMISSION

Advertisement No. A-5/E-1/2021 Date 13.08.2021

## Combined State Engineering Services (General Recruitment/Special Recruitment) Examination-2021

Date of Commencement of On-line Application : 13.08.2021

Last Date for Receipt of Examination Fee On-line in the Bank : 10.09.2021

Last Date for On-line Submission of Application : 13.09.2021

### Important

(i) If at any stage it is found that the candidate has concealed or misrepresented any desired/required information, his candidature may be cancelled and other appropriate action like debarment may be initiated against him.

(ii) The candidates must send hard copy of their on-line applications and enclose self attested copies of all certificates in support of their claims rendered in the on-line application. In this Connection, a separate press communique shall be published in due course by the commission.

(iii) The candidates are directed to ensure the preservation of information regarding all the stages (i.e. Registration, Fee Payment, Final Submission etc.) in Soft/Hard Copy for future references at the time of Online application.

"SPECIAL NOTICE :- (a) On-Line Applications will be accepted only when prescribed fee is deposited in the Bank upto prescribed last date for fee deposit. If the fee is deposited in Bank after the last date prescribed for fee deposit, the on-line application of the candidate will not be accepted and the fee deposited in the Bank will not be refunded in any condition. It will be responsibility of the candidates to deposit fee in the Bank upto the last date prescribed for fee deposit and to 'submit' the application upto the last date prescribed for submission of applications. It is also informed that any amount deposited in the form of examination fee shall not be refunded in any condition.

(b) In Online Application System, the candidates have to provide their Mobile No. and valid e-mail ID in prescribed column failing which their Basic Registration shall not be completed. All relevant informations/instructions shall be sent through SMS on that mobile and e-mail on their valid e-mail ID.

### NECESSARY INFORMATION TO APPLICANTS FOR FILLING THEIR APPLICATIONS THROUGH ON-LINE

This advertisement is also available on the Commission's website <http://uppsc.up.nic.in>. The online application system is applicable for applying against this advertisement. Applications sent by any other mode shall not be entertained hence candidates are advised to apply On-line only. In connection with On-line application, candidates are advised to go through the instructions thoroughly given as under and apply accordingly.

1. When the candidate clicks "ALL NOTIFICATIONS/ADVERTISEMENTS" on the Commission's website <http://uppsc.up.nic.in> the On-line advertisement shall be automatically displayed, wherein there shall be 3 parts as given below :

1. User instructions
2. View Advertisement
3. Apply

A list of all the advertisements will be displayed in which "On-line System" is applicable. The Instructions for filling "On-line form" have been given in User Instruction. The Candidates desirous to see the advertisement will have to click before 'View Advertisement' to which they are desirous to see, full advertisement will be displayed along with sample snapshots of ON-LINE Application Procedure. Click on "Apply" for On-line Application.

On-line application will be completed in three stages :

**First Stage:** On clicking "Apply", Candidate Registration will be displayed. Basic Registration form will be displayed on clicking the 'Candidate Registration' respective to Examination. After filling the Basic Registration form, the candidates must check all the informations filled by them. If any correction/modification is required, click on "Edit" button and ensure the required corrections/ modifications. After being fully satisfied with all the informations filled, click on 'Submit button'. Consequently, the registration of first stage shall be over. Thereafter 'Print Registration Slip' shall be displayed and Print of Registration Slip must be taken by clicking on Print Registration Slip.

**Second Stage:** After the completion of the procedure of first stage. 'Fee to be deposited [in INR]' shall be displayed with caption "Click here to proceed for payment". After clicking the above caption of "Click here to proceed for payment", home page of State Bank MOPS (Multi Option Payment System) shall be displayed comprising of 03 modes of payment viz.

(i) NET BANKING (ii) CARD PAYMENTS and (iii) OTHER PAYMENT MODES. After depositing the required fee by any one of the above prescribed modes, "Payment Acknowledgement Receipt (PAR)" shall be displayed along with detail of fee deposit, the print of which must be taken by clicking on "Print Payment Receipt."

**Third stage :** On completion of the procedure of second stage, click on "Proceed for final submission of application form as a result of which 'format' shall be displayed. The candidates are required to enter all the required informations in the format. The photo and signature, duly scanned shall be uploaded also. The candidate should scan his/her photograph and signature in the prescribed size (the size will be mentioned at the specified space in the On-line application). This should also be kept in notice that the photo must be latest passport size. In case the photo and signature, scanned in the prescribed size, are not uploaded, then the On-line system will not accept it. The procedure related for scanning of the photo and signature is laid down in the **Appendix-1**. After filling in all entries in the format, the candidates may click "PREVIEW" to see for themselves that all entries and informations are correctly entered and after satisfying themselves should click "Submit" button to forward the same to the Commission. It is essential that the candidate should fill all informations On-line correctly according to the instructions given and click the "Submit" button by the last date prescribed for submission of the application form. If the candidate does not click the "Submit" button, the ON-LINE application process shall not be completed finally and the candidate shall be accountable for this. After clicking the "Submit" button, the candidate may take a print of the application to preserve it with them. In the event of any discrepancy, the candidate will be required to submit the said print in the office of the Commission, otherwise his/her request shall not be entertained.

**2. Application Fee :** In the ON-LINE Application process, after completing the procedure of first stage, Category wise prescribed examination fee is to be deposited as per Instructions provided in second stage.

The prescribed fee of examination for different categories is as under:-

- (i) Unreserved/Economically - weaker Sections/Other Backward Class - Exam fee ₹ 200/- + On-line processing fee ₹ 25/- Total = ₹ 225/-
- (ii) Scheduled Caste/ Scheduled Tribe - Exam fee ₹ 80/- + On-line processing fee ₹ 25/- Total = ₹ 105/-
- (iii) Handicapped - Exam fee NIL + On-line processing fee ₹ 25/- Total = ₹ 25/-
- (iv) Ex-Service Man - Exam fee ₹ 80/- + On-line processing fee ₹ 25/- Total = ₹ 105/-

(v) Dependents of the Freedom Fighters/Women - According to their original category

3. The Basic Registration of such candidates will not be accepted who have been debarred from U.P. Public Service Commission and their period of debarment has not been completed. In addition to above, the applications submitted without requisite informations regarding debarment, if it is found at any stage in future that the application have been submitted concealing this fact, his/her candidature will be rejected at any stage and the commission will consider to debar them from all future examinations/selections including extension of debarment period. In this regard, if the claims of the candidates made in their On-line applications are not found true, they can be debarred not only from the examination in question but from all the future examinations and selections made by the commission also including other appropriate penalties.

**4. Modify Submitted Application:** If a candidates comes to know about any error/errors in the submitted application form except in name of the Examination and type of recruitment, Registered Mobile Number, E-mail ID, Aadhaar Number and such cases where prescribed fee for modified category is higher (In case of error in these entries, candidate may submit new online application with prescribed fee only as previously deposited fee will neither be adjusted nor refunded) he/she will be given only one opportunity to modify it/them according to the following procedure before the last date of the submission of application form. "Candidate has to click on 'Modify Submitted Application' under 'Online application process' in Candidate Segment. After that 'Candidate Personal Details' will be displayed on the screen to fill in Registration No., Date of Birth, Gender, Domicile and Category. After filling the Verification code the candidate has to click on the 'proceed' button following which for Authentication of the candidate OTP (One Time Password) will be sent on the registered mobile No. of the candidate and the 'Option Box' will be displayed on the screen to fill in the OTP. After the candidate has filled in the OTP and clicks on the 'proceed' button his/her previously submitted on line application form will be displayed on the screen. The candidate can submit his/her on line application form after making required modifications in it. This facility will be available to the candidates only one time within the last date of submission of application form".

5. The U.P. Public Service Commission shall hold a Written Examination at various Centres of the Districts mentioned in **Appendix-2** of this advertisement. Only such candidates will be called for interview who are declared successful on the basis of above Examination. The selection will be made on the basis of total marks obtained by the candidates in written examination and interview. The date and centre of examination decided by the Commission, will be intimated to the candidates by means of their e-Admission certificate. The No. of Districts/Centres may be increased or decreased according to the decision of the Commission on the basis of final No. of applications received.

**6. No. of Vacancies :** Vacancies are as under :-

(i) **General Recruitment**

Sl. No.	Name of Department	Name of post	No. of Vacancies	Branch
1	Public Works Deptt. (P.W.D.)	Asstt. Engg. (Civil)	36	Civil
2	Public Works Deptt. (P.W.D.)	Asstt. Engg. (Electrical/Mechanical)	28	Electrical/Mechanical
3	Housing and urban Planning Deptt.	Asstt. Engg. (Civil)	21	Civil
4	Nagar Vikas Vibhag	Asstt. Engg. (Water)/'B' Category Jalkal Engg.	14	Civil/Electrical /Mechanical
5	Nagar Vikas Vibhag	Asstt. Engg. (Traffic)	04	Civil
6	Agriculture Deptt.	U.P. Agriculture Service Group 'B' (Engg. Branch)	04	Agriculture
7	Avas Evam Vikas Parishad	Asstt. Engg. (Civil)	76	Civil
8	Avas Evam Vikas Parishad	Asstt. Engg. (Electrical)	04	Electrical
9	Ground Water department	Asstt. Engg. (Civil)	06	Civil
10	Ground Water department	Asstt. Engg. (Mechanical)	03	Mechanical
11	Minor Irrigation department	Asstt. Engg. (Agriculture)	07	Agriculture
12	Industrial development Deptt.	Manager (Civil)	49	Civil
13	Industrial development Department	Manager (Electrical/Mechanical)	05	Electrical/Mechanical
14	Home (Police) Department	Chief Fire Officer	13	Civil/Mechanical/Electrical/Chemical Industrial/Fire/Hydraulics
15	Information and Public Relations Deptt.	Assistant Television Engg.	01	Electronics
<b>Total</b>			<b>271</b>	
<b>(ii) Special Recruitment</b>				
16	Rural Engg. Deptt.	Asstt. Engg. (Civil)	10 (SC/OBC)	Civil

**Pay Scale :** Rs. 15,600-Rs. 39,100/- Grade Pay Rs. 5400/-.

**Note:-** No. of vacancies may increase or decrease depending upon the circumstances/requirements.

**7. Reservation :** The reservation for candidates of Scheduled Castes of U.P./Scheduled Tribes of U.P./Other Backward Classes of U.P./Economically Weaker Sections of U.P. shall be admissible in accordance with the provisions of relevant Govt. Rules. Similarly, reservation for horizontal category candidates such as Dependents of Freedom Fighters of U.P., Ex-serviceman of U.P., P.H. of U.P. and Women candidates, shall be admissible on settlement of vacancies. Reservation for PH of U.P. shall be permissible for the notified/identified posts.

**Note :** (1) शासनादेश संख्या-39 रिट/का-2/2019 दिनांक-26 जून, 2019 द्वारा शासनादेश संख्या-18/1/99/का-2/2006 दिनांक-09 जनवरी, 2007 के प्रस्तर-4 में दिये गये प्राविधान, 'यह भी स्पष्ट

continued.



**UTTAR PRADESH PUBLIC SERVICE COMMISSION**

(2)

किया जाता है कि राज्याधीन लोक सेवाओं और पदों पर सीधी भर्ती के प्रक्रम पर महिलाओं को अनुमत्य उपरोक्त आरक्षण केवल उत्तर प्रदेश की मूल निवासी महिलाओं को ही अनुमत्य है" को रिट याचिका संख्या-11039/2018 विपिन कुमार मौर्या व अन्य बनाम उत्तर प्रदेश राज्य व अन्य तथा सम्बद्ध 6 अन्य रिट याचिकाओं में मा. उच्च न्यायालय, इलाहाबाद द्वारा दिनांक-16-01-2019 को अधिकारातीत (ULTRA VIRES) घोषित करने सम्बन्धी निर्णय के अनुपालन में शासनादेश दिनांक-09-01-2007 से प्रस्तर-04 को विलोपित किए जाने का निर्णय लिया गया है। उक्त निर्णय शासन द्वारा मा. उच्च न्यायालय के आदेश दिनांक-16.01.2019 के विरुद्ध दायर विशेष अपील (डी) संख्या-475/2019 में मा. उच्च न्यायालय द्वारा पारित होने वाले अन्तिम निर्णय के अधीन होगा। (2) The Candidates claiming the benefit of reservation/age relaxation must obtain, in support of their category a certificate issued by competent authority on the proforma available on Appendix-3 of the Website of this detailed advertisement and shall submit the same to the Commission when asked for. (3) All Reserved category candidates of U.P. must mention their Category/Sub Category in the Application. (4) Candidates claiming reservation/Age relaxation in more than one category will be entitled to only one concession whichever is more beneficial to them. (5) The Scheduled Caste, Scheduled Tribes, Other Backward Class, Economically Weaker Sections, Dependents of Freedom Fighter, Ex-service Man and PH candidates who are not the permanent residents of U.P. shall not be given the benefit of reservation/Age relaxation. (6) In case of women candidates the caste certificate issued from father side only will be treated valid.

**8. Conditions of Eligibility (For age relaxation only) : (I) Eligibility in case of Emergency Commissioned/Short Service Commissioned Officers:** In accordance with the provision of the G.O. No. 22/10/1976-Karmik-2-85, dated 30-1-1985 Emergency Commissioned/Short Service Commissioned Officers who have not been released from Army but whose period of Army service has been extended for rehabilitation may also apply for this examination on the following conditions: (A) Such applicants will have to obtain a certificate of the competent authority of Army, Navy, Air Force to the effect that their period of Service has been extended for rehabilitation and no disciplinary action is pending against them. (B) Such applicants will have to submit in due course a written undertaking that in case they are selected for the post applied for, they will get themselves released immediately from the Army Service. The above facilities will not be admissible to Emergency/Short Service Commissioned Officers, if (a) he gets permanent Commission in the Army, (b) he has been released from the Army on tendering resignation, (c) he has been released from the Army on grounds of misconduct or physical disability or on his own request and who gets gratuity.

**9. MARITAL STATUS :** Male candidates who are married and have more than one wife living and female candidates who have married a person already having a wife, shall not be eligible unless the Hon'ble Governor has granted exemption from this condition.

**10. EDUCATIONAL QUALIFICATION :**

Sl. No.	Name of post/ Name of Deptt.	Qualifications
1.	<b>Assistant Engineer (Civil) Public Works Department (P.W.D) (Sl. No.- 1 in table of vacancies)</b>	<b>Essential-</b> Must possess a Bachelor's degree in Civil Engineering from a university established by law in India or a qualification recognized by the Government as equivalent thereto. <b>Preferential:</b> A Candidate who has (1) served in the Territorial Army for a minimum period of two years, or (2) obtained a 'B' Certificate of N.C.C. or (3) Successfully completed one year training as trainee shall other things being equal, be given preference in the matter of direct recruitment.
2.	<b>Assistant Engineer (Electrical/ Mechanical) Public Works Department (P.W.D) (Sl. No.- 2 in table of vacancies)</b>	<b>Essential-</b> Degree in Electrical or Mechanical Engineering from an university established by law in India or any degree recognised equivalent by the Govt. or passed Associate Examination of Electrical or Mechanical Engineering from City and Guild Institute (Imperial College of Science and Technology South, Kesington) or passed section 'A' and 'B' of Electrical or Mechanical Engineering of Associate Membership of Institution of Engineers London or completely eligible Associate Engineers (India) or passed section 'A' and 'B' in Electrical or Mechanical Engineering of Institution of Engineers (India). <b>Preferential:</b> A Candidate who has (1) served in the Territorial Army for a minimum period of two years, or (2) obtained a "B" Certificate of N.C.C. shall other things being equal, be given preference in matter of direct recruitment.
3.	<b>Assistant Engineer (Civil) (Housing and Urban Planning Department) (Sl. No.- 3 in table of vacancies)</b>	<b>Essential-</b> Degree in Civil Engineering from a recognized college or university in India or abroad. <b>Preferential:</b> A Candidate who has (1) Served in the Territorial Army for a minimum period of two years, or (2) obtained a "B" Certificate of N.C.C. shall other things being equal, be given preference in the matter of direct recruitment.
4.	<b>Assistant Engineer (Water)/'B' Category Jalkal Engineer (Nagar Vikas Vibhag) (Sl. No.- 4 in table of vacancies)</b>	<b>अनिवार्य:-</b> भारत या विदेश में किसी मान्यता प्राप्त कॉलेज या विश्वविद्यालय से सिविल इंजीनियरिंग या इलेक्ट्रिकल या मैकेनिकल इंजीनियरिंग की डिग्री जो इन्स्टीट्यूशन ऑफ इंजीनियर्स (इण्डिया) द्वारा मान्य हो और जिसके आधार पर अभ्यर्थी उक्त इन्स्टीट्यूशन के एसोसिएट मेम्बरशिप सेवशन 'ए' तथा 'बी' से मुक्त हो या अभ्यर्थी ने सिविल इंजीनियरिंग / इलेक्ट्रिकल / मैकेनिकल इंजीनियरिंग में इन्स्टीट्यूशन ऑफ इंजीनियर्स (इण्डिया) का सेवशन 'ए' तथा 'बी' अवश्य पास किया हो। <b>अधिमानी:-</b> अन्य बातों के समान होने पर ऐसे अभ्यर्थी को अधिमान दिया जाएगा जिसने (1) प्रादेशिक सेना में न्यूनतम 02 वर्ष की अवधि तक सेवा की हो, या (2) राष्ट्रीय कैडेट कोर का "बी" प्रमाण-पत्र प्राप्त किया हो।
5.	<b>Assistant Engineer (Traffic) (Nagar Vikas) (Sl. No. 5 in table of vacancies)</b>	<b>अनिवार्य:-</b> भारत या विदेश में किसी मान्यता प्राप्त कॉलेज या विश्वविद्यालय से सिविल इंजीनियरिंग की डिग्री जो इन्स्टीट्यूशन ऑफ इंजीनियर्स (इण्डिया) द्वारा मान्य हो और जिसके आधार पर अभ्यर्थी उक्त इन्स्टीट्यूशन के एसोसिएट मेम्बरशिप परीक्षा के सेवशन 'ए' तथा 'बी' से मुक्त हो या अभ्यर्थी ने सिविल इंजीनियरिंग में इन्स्टीट्यूशन ऑफ इंजीनियर्स (इण्डिया) की एसोसिएट परीक्षा के सेवशन 'ए' तथा 'बी' अवश्य पास कर लिये हो। <b>अधिमानी:-</b> अन्य बातों के समान होने पर ऐसे अभ्यर्थी को अधिमान दिया जाएगा जिसने (1) प्रादेशिक सेना में न्यूनतम 02 वर्ष की अवधि तक सेवा की हो, या (2) राष्ट्रीय कैडेट कोर का "बी" प्रमाण-पत्र प्राप्त किया हो।
6.	<b>U.P Agriculture Service Group "B"</b>	<b>Essential-</b> Bachelor's degree in Agriculture Engineering from a University established by Law in India or a qualification

(Engineering branch) (Agriculture Department) (Sl. No.- 6 in table of vacancies)	recognized by Government as equivalent there to. <b>Preferential (i)</b> Post graduate degree in Agricultural Engineering from a university established by law in India or a qualification recognized by Government as equivalent there to. (ii) Served in the Territorial Army for a minimum period of 02 years or (iii) obtained a "B" Certificate of N.C.C. shall other things being equal, be given preference in the matter of direct recruitment.
7. Assistant Engineer (Civil) (Avas Evam Vikas Parishad) (Sl. No.- 7 in table of vacancies)	A candidate for direct recruitment to the service must, besides having a thorough Knowledge of Hindi written in Devanagri Script, hold the following qualification: A Degree in Civil Engineering from a University or institution established by Law in Uttar Pradesh or from any other Institution recognized by the State/Central Government or a Degree recognized as equivalent there to by the State/Central Government.
8. Assistant Engineer (Electrical) (Avas Evam Vikas Parishad) (Sl. No.- 8 in table of vacancies)	A candidate for direct recruitment to the service must, besides having a thorough Knowledge of Hindi written in Devanagri Script, hold the following qualification: A Degree in Electrical Engineering from a University or institution established by Law in Uttar Pradesh or from any other Institution recognized by the State/Central Government or a Degree recognized as equivalent thereto by the State/Central Government.
9. Assistant Engineer (Civil) (Ground Water department) (Sl. No.- 9 in table of vacancies)	<b>अनिवार्य:-</b> भारत में विधि द्वारा स्थापित किसी विश्वविद्यालय या मान्यता प्राप्त संस्था से न्यूनतम 60 प्रतिशत अंकों सहित सिविल अभियन्त्रण में स्नातक उपाधि या इन्स्टीट्यूशन ऑफ इंजीनियर्स (इण्डिया) (सिविल अभियन्त्रण शाखा) का सहयुक्त सदस्य या सरकार द्वारा उसके समकक्ष मान्यता प्राप्त कोई उपाधि। <b>अधिमानी- (1)</b> 60 प्रतिशत अंकों सहित भू-गर्भ भू-जल (ग्राउन्ड वाटर हाइड्रोलॉजी) में स्नातकोत्तर डिप्लोमा। <b>(2)</b> भू-गर्भ जल अन्वेषण और समन्वेषण में 02 वर्ष का अनुभव।
10. Assistant Engineer (Mechanical) (Ground Water department) (Sl. No.- 10 in table of vacancies)	<b>अनिवार्य:-</b> भारत में विधि द्वारा स्थापित किसी विश्वविद्यालय या मान्यता प्राप्त संस्था से न्यूनतम 60 प्रतिशत अंकों सहित यांत्रिक अभियन्त्रण में स्नातक उपाधि या इन्स्टीट्यूशन ऑफ इंजीनियर्स (इण्डिया) (यांत्रिक शाखा) का सहयुक्त सदस्य या सरकार द्वारा उसके समकक्ष मान्यता प्राप्त कोई उपाधि। <b>अधिमानी- (1)</b> 60 प्रतिशत अंकों सहित भू-गर्भ भू-जल (ग्राउन्ड वाटर हाइड्रोलॉजी) में स्नातकोत्तर डिप्लोमा। <b>(2)</b> भू-गर्भ जल अन्वेषण और समन्वेषण में 02 वर्ष का अनुभव।
11. Assistant Engineer (Civil/Mechanical/ Agriculture) (Minor Irrigation department) (Sl. No.- 11 in table of vacancies)	<b>Essential-</b> Bachelor's degree in civil or Mechanical or Agricultural Engineering or a degree recognized by the Government as equivalent thereto or has passed Associated Membership Examination in Section 'A' and 'B' in civil or Mechanical Engineering from Institution of Engineers (India) <b>Preferential:</b> Candidate who has (1) Served in the Territorial Army for a minimum period of two years or (2) obtained a "B" Certificate of N.C.C. Shall other things being equal, be given preference in matter of direct recruitment.
12. Manager (Civil) Industrial development deptt. (Sl. No.- 12 in table of vacancies)	<b>Essential-</b> Degree in relevant branch <b>Preferential:</b> Candidate who has (1) Served in the Territorial Army for a minimum period of two years or (2) obtained a "B" Certificate of N.C.C. Shall other things being equal, be given preference in matter of direct recruitment.
13. Manager (Electrical/ Mechanical) Industrial development deptt. (Sl. No.- 13 in table of vacancies)	<b>Essential-</b> Degree in relevant branch <b>Preferential:</b> Candidate who has (1) Served in the territorial Army for a minimum period of two years or (2) obtained a "B" Certificate of N.C.C. Shall other things being equal, be given preference in matter of direct recruitment.
14. Chief Fire Officer Home (Police) Deptt. (Sl. No.- 14 in table of vacancies)	<b>Essential-</b> A candidate for direct recruitment to the post of Chief Fire Officer in the Service must possess the following qualifications: Degree in Fire Engineering from National Fire Service College, Nagpur or any equivalent degree from an Institution of comparable status recognized by Government of India and the State Government of Uttar Pradesh; or Bachelor of Engineering/B. Tech in Mechanical/Chemical/ Civil/Electrical/Industrial/Hydraulic Engineering from an Institution recognized by the Government of India and the State Government of Uttar Pradesh. <b>PREFERENTIAL:</b> A candidate who has: (i) served in the Territorial Army for a minimum period of two years, or (2) obtained "B" Certificate of National Cadet Corps, shall, other things being equal, be given preference in the matter of direct recruitment.
15. Assistant Television Engineer (Information) and Public Relations Deptt. (Sl. No.- 15 in table of vacancies)	<b>Essential-</b> A degree in Electronics Engineering from a University established by law in India or a qualification recognized by the Government as equivalent thereto. <b>Preferential:</b> A candidate who has. (i) served in the Territorial Army for a minimum period of two years, or (2) obtained a "B" Certificate of N.C.C. shall other things being equal, be given preference in the matter of direct recruitment.
16. Assistant Engineer (Civil) (Rural Engineering Department) (Sl. No.- 16 in table of vacancies)	<b>Essential-</b> Must possess (A) a Bachelor degree in Civil Engineering from an Institution or University recognized by the Government or (B) has passed Associate Membership Examination in Section "A" and "B" in Civil Engineering from Institution of Engineers (India) <b>Preferential:</b> Candidate who has. (i) served in the Territorial Army for a minimum period of two years, or (2) obtained a 'B' Certificate of N.C.C. shall other things being equal, be given

continued..



preference in the matter of direct recruitment.

**Note:-** The requisition of the vacancies of only agriculture engineering cadre under Minor Irrigation department mentioned at Sl. No. 11 of the above table has been received till date.

**11. (i) AGE LIMIT :** Candidates must have attained the age of 21 years and must not have crossed the age of 40 years on July 1, 2021 i.e. they must have not been born earlier than 2nd July, 1981 and not later than July 1, 2000. For PH candidates, the maximum age limit is 55 years i.e. they must have not been born before 02 July, 1966. **(ii) Relaxation in Upper Age Limit:** (a) Upper age limit shall be greater by five years for candidates belonging to Scheduled Castes of U.P., Scheduled Tribes of U.P., Other Backward Classes of U.P., Skilled players of U.P. of Classified Games, State Govt. Employees of U.P. including Teachers/Staff of the Basic Shiksha Parishad of U.P. and Teachers/Staff of the Government Aided Madhyamik Vidyalayas of U.P. i.e. they must have not been born before 2nd July, 1976. (b) Upper age limit shall be greater by fifteen years for physically handicapped persons of U.P. (c) Upper age limit shall also be greater by 3 years + period of service rendered in army for the Emergency Commissioned Officers/ Short Service Commissioned Officers/Ex-Army Personnels of U.P..

**Note- (i) For the posts of Assistant Engineer (Civil) of P.W.D. (Sl. No.- 1 of vacancy table)- "The upper age limit in the case of a candidate, who is trainee, shall be greater by one year" (ii) For the post of Assistant Engineer (Civil) of Housing and Urban Planning department (Sl. No.- 3 of vacancy table):- "(A) In the case of a person who has already rendered one year's service or more in any of the service in the development Authority, the maximum age limit shall be greater to the extent he has rendered continuous service or for a period of seven years whichever is less. (B) A candidate who was entitled in respect of his age to appear at a selection in any year in which no selection is made though a vacancy existed, shall be deemed to be entitled in respect of his age to appear at the next following selection." (iii) For the post of Assistant Engineer (Water)/'B' Category- Jalka Engineer (Sl. No.- 4 of vacancy table)- "(A) In the case of person who has already rendered one year's service or more in any of the centralised services or in the Palika or Jal Sansthan, as the case may be, the maximum age-limit shall be greater to the extent he has rendered continuous services or a period of Seven year, whichever is less. (B) A candidate, who was entitled in respect of his age to appear at a selection in any year in which no selection is made, shall be deemed to be entitled in respect of his age to appear at the next following selection." (iv) सहायक अभियन्ता (ट्रैफिक) रिक्तियों की तालिका के क्र. सं 5) पद हेतु:- (क) किसी ऐसे व्यक्ति की दशा में जिसने किसी भी केन्द्रीयित सेवा अथवा पालिका में एक वर्ष या उससे अधिक की सेवा कर ली हो, अधिकतम आयु निरन्तर सेवा अथवा सात वर्ष की अवधि इसमें जो भी कम हो, की सीमा तक अधिक होगी। (ख) यदि कोई अभ्यर्थी जो अपनी आयु के आधार पर किसी ऐसे वर्ष में चयन में उपस्थित होने के लिए हकदार होता है, जिसमें कोई चयन किया गया हो तो वह अपनी आयु के आधार पर अगले अनुवर्ती चयन में उपस्थित होने के लिए हकदार समझा जायेगा। (v) उ०प्र० आवास एवं विकास परिषद में सहायक अभियन्ता (सिविल/विद्युत) (रिक्तियों की तालिका के क्रम सं 7 एवं 8 पद हेतु:- "उ०प्र० आवास एवं विकास परिषद के कार्मिकों को अधिकतम आयु सीमा में पाँच वर्ष की छूट प्रदान की जायेगी।" (vi) For the posts of Manager (Civil) and Manager (Electrical/ Mechanical) of Industrial development department (Sl No. 12 and 13 in table of vacancies):- (a) In the case of a person who has already rendered one year's service or more in any of the service in the Authority, the maximum age limit shall be greater to the extent he has rendered continuous service or for a period of seven years whichever is less (b) A candidate who has entitled in respect of his age to appear at a selection in any year in which no selection is made though a vacancy existed, shall be deemed to be entitled in respect of his age to appear at the next following selection.**

**12. SOME INFORMATION ABOUT EXAMINATION AND INTERVIEW :** (1) The dates and venue for the examination shall be informed by the Commission later on through e-Admit Card. (ii) Only such candidates will be called for interview who are declared successful on the basis of the written examination. (iii) All original certificates shall be verified at the time of interview. Candidates will also be required to furnish four passport size Photographs, two unattested and two attested by their Head of Department or Head of the Institution where they received education or by a Gazetted Officer at the time of Interview. (iv) Candidates serving under the Central or State Government will have to produce 'No Objection Certificate' from their employer at the time of interview issued by the competent authority. (v) It is essential for the candidates to appear in the interview who qualify on the basis of written examination.

**13. IMPORTANT INSTRUCTIONS FOR CANDIDATES:** (1) As per decision of the UPPSC a candidate will be liable to be debarred from this examination and all other future examinations and selections upto a maximum period of five years for furnishing any wrong information in his/her application form which cannot be substantiated by relevant documents or for any other malpractice. (2) The claim of category, subcategory, domicile, gender, date of birth, name and address will be valid only till the last date of online application. In this regard no application for error correction/modification shall be acceptable. Incomplete application form shall be summarily rejected and no correspondence shall be entertained in this regard. On submission of false/misleading information, the candidature will be cancelled. (3) The date of birth of the candidates shall be admissible as entered in High School Certificate. The candidate will have to attach his/her High School or Equivalent Examination Certificate with the application form of Examination. No Other Certificate shall be acceptable for Date of Birth and if it is not attached with the application it shall be rejected. (4) The candidates will have to enclose self attested copies of Marksheets, Certificates & Degrees along with the application form of examination in support of their claims of Educational Qualifications. If they do not enclose self attested copies of certificates/documents in support of their claims, the application shall be rejected. (5) The benefit of reservation to the categories of Handicapped persons of society shall be given only on the posts which shall be identified by the Government for their Sub category. For this benefit, the Handicapped persons must produce a certificate of being handicapped in that Sub category issued by prescribed Medical Officer/Specialist and counter signed by the Chief Medical Officer according to Rule 3 of U.P. Public Service (Reservation for physically Handicapped, Dependent of Freedom Fighters and Ex-Servicemen (Amendment) Act, 2018. It is worth while mentioning that as per section-3 of the said Act, the new identification of post has not yet been received from the government, however as per identification (Category/Subcategory) mentioned in requisitions received from the Appointing authorities the selection process will be completed accordingly. (6) The Ex-Army personnels must be discharged from army upto the last date prescribed for receipt of applications. (7) Date, time and venue etc. of examination along with Roll No. will be communicated to the candidates through e-Admit Cards, Candidates will have to appear at the centre/venue allotted to them by the Commission. No change in centre/venue is permissible and no application shall be entertained in this regard. (8) The

candidature of such candidates who are subsequently found ineligible according to the terms laid down in advertisement will be cancelled and their any claim for the Examination will not be entertained. The decision of the Commission regarding eligibility of the candidates shall be final. (9) The Application/candidature will be rejected/ cancelled if the application is not submitted on prescribed form, date of birth is not mentioned or wrong date of birth is mentioned, overage, under age, not fulfilling the minimum educational qualifications, application received after last date and no signature under declaration in the format. (10) The Commission may admit the candidates provisionally after summarily checking of the application but if it is found at any stage that applicant was not eligible or that his/her application should have been rejected or was not entertainable initially, his/her candidature will be rejected and if the candidate is selected, the recommendation of the Commission for appointment shall be withdrawn. (11) The Commission reserves the right of cancelling the candidature of any candidate found indulging in any malpractice i.e. copying in examination hall or indiscipline, misbehaviour or canvassing for his/her candidature. On violation of these instructions, the candidates may be debarred from this examination as well as future examinations. In this regard the decision of the Commission shall be final. (12) In all communications to the Commission, the candidates must mention the name of examination, advertisement No., registration No., date of birth, father's/husband's name and also the Roll Number, if communicated. (13) Candidates selected for appointment will have to undergo Medical Examination as required under the Rules. (14) 2 times candidates to the number of vacancies shall be called for interview on the basis of written examination. It is essential for the candidates to appear in the interview as the place of candidates will depend on aggregate of marks obtained in written examination and interview. Preferences for Deptt. wise posts will be asked at the time of interview which will be treated final and no change, therein will be admitted later. (15) The candidates who are appearing in the Examination of essential qualification prescribed for the posts need not to apply, because they are not eligible. (16) While filling the OMR answer sheets the candidates "must use Black Ball Point Pen only". Use of any other pen or pencil is strictly prohibited. (17) Candidates are directed to fill in all the entries correctly in the OMR Answer Sheet. In case of leaving them blank or filling them erroneously the candidate will be wholly responsible for the same & the commission will not evaluate his/her OMR Answer Sheet. The informations filled in the OMR Answer Sheets must not be erased by whitener, blade or rubber etc. (18) Candidates shall be provided OMR Answer Sheets in duplicates i.e. original copy and candidate's copy. After completion of the examination, the candidates are required to hand over the original copy to the Invigilator and the candidate's copy to keep with them. (19) In the Examination for the objective type Question papers, penalty (Negative Marking) shall be imposed for wrong answers given by the candidates which is as below:- (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, one third (0.33) of the marks assigned to that question will be deducted as penalty. (ii) If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answer happens to be correct and there will be same penalty as above for that question. (iii) If a question is left blank i.e. no answer is given by the candidate there will be no penalty for that question. (20) The minimum efficiency standard for S.C. & S.T. candidates is fixed 35% i.e. the Candidates of these Categories shall not be placed in the merit/select list if they have secured less than 35% marks in the examination. Similarly, the minimum efficiency standard for the candidates of other categories is fixed 40% i.e. such candidates shall not be placed in the merit/select list if they have secured less than 40% marks in the examination. All such candidates who have secured less marks than the marks of minimum efficiency standard as fixed by the Commission shall be treated disqualified. (21) **If it is found that a candidate has submitted any forged documents he/she will be debarred from all selection of U.P.P.S.C forever and action under relevant sections of I.P.C will also be taken against him/her.**

#### GENERAL INSTRUCTIONS

- In no circumstances, applications of any stage shall be accepted after the last prescribed date and time. Applications found without requisite informations and without photograph and signature, even when received in time, may be summarily rejected.
- In the On-line system the candidates must ensure that all the requisite informations have been duly filled and must click the submit Button by the Last prescribed Date & Time. Candidates must take the print and keep it safely. In any discrepancy candidates will have to produce the said print otherwise no request shall be entertained.
- Those candidates, willing to take the benefit of the reservation/age relaxation must obtain a certificate, issued by the competent authority, in support of the reserved category, in the prescribed format printed in this detailed advertisement (**Appendix-3**) and submit the same to the Commission, whenever required to do so. Those claiming more than one reservation/Age relaxation will be given only one such concession, which will be more beneficial. The candidates who are not originally domiciled of U.P. belonging to SC, ST, O.B.C., EWS, dependants of freedom fighters, Ex-Servicemen, skilled players and P.H. are not entitled to benefit of reservation/age relaxation. In case of the women candidates, the caste certificate issued from father side will be treated valid.
- The Commission do not advise to candidates about their eligibility. Therefore, they should carefully read the advertisement and when satisfied about their eligibility conditions of the advertisement, then only apply. The candidates must possess all the requisite qualifications till the last date for submitting the applications.
- In the category of dependants of the freedom fighters only sons, daughters, grandsons (Son's son/Daughter's son) and grand daughters (son's daughter/daughter's daughter, married/unmarried) are covered. It is advised that the candidates of the aforesaid category must obtain the reservation certificate from the District Magistrate in terms of Govt. Order No. 453/79-V-1-15-1(Ka)14-2015 dated 07.04.2015 in the prescribed format and submit the same.
- In the event of involvement of a candidate in the concealment of any important information, pendency of any case/criminal case, conviction, more than a husband or wife being alive, submission of facts in a distorted manner malpractice, canvassing for candidature/selection etc., the Commission reserves the right to reject the candidature and debar him from appearing in the examination in question and in all other future examinations and selections.
- In case the candidates feel any problem in the "On-line Application" they may get their problem resolved by contacting over phone or on Website clicking 'Contact us'.
- The name of Districts for Examination are available in the advertisement in **Appendix-2**. In the same way the plan of Examination and the syllabus on **Appendix-4**.

#### Detailed Application Form:

At the top of the page, there is a Declaration. The candidates are advised to go through the content of the Declaration carefully. Candidate has the option either to agree or

disagree with the content of Declaration by clicking on 'I Agree' or 'I do not agree' buttons. In case the candidate opts to disagree, the application will be dropped, and the procedure will be terminated. Accepting to agree only will submit the candidate's On-line Application.

**Notification Details :**

This section shows information relevant to Notification

**Personal Details**

This section shows information about candidate's personal details i.e. Registration Number, candidate's name, Father/Husband's name, Gender, DOB, UP domicile, Category, Marital status, email ID and contact number.

**Other Details of Candidate**

Other details of candidate shows the information details about UP Freedom Fighter, Ex Army service duration and your physical deformity.

**Education & Experience Details**

Its shows your educational and experience details.

**Candidate address, photo & signature details**

Here you will see your complete communication address and photo with your signature.

**Declaration segment**

At the bottom of the page there is a 'Declaration' for the candidates. Candidates are advised to go through the content of the Declaration carefully.

After filling all above particulars there is provision for preview your detail before final submission of application form on clicking on "Preview" button.

Preview page will display all facts/particulars that you have mentioned on entry time, if you are sure with filled details then click on "Submit" button to finally push data into server with successfully submission report that you can print.

Otherwise using "Back" button you can modify your details.

**[CANDIDATES ARE ADVISED TO TAKE A PRINT OF THIS PAGE BY CLICKING ON THE "PRINT" OPTION AVAILABLE]**

**For other Information:** For other Information candidates are advised to select desired option in 'Home Page' of Commission's website <http://uppsc.up.nic.in>

**CANDIDATE SEGMENT**

<b>NOTIFICATIONS/ADVTs</b>
<b>All Notification/Advertisements</b>
<b>ONLINE FORM SUBMISSION</b>
1. Candidate Registration (First Stage)
2. Fee Deposition / Reconciliation (SECOND STAGE)
3. Submit Application Form (Third Stage)
<b>APPLICATION FORM STATUS</b>
Update your transaction ID by Double Verification mode View Application Status
List of Applications Having photo related Objections
Print Duplicate Registration Slip
Print Detailed Application Form
<b>EXAMINATION SEGMENT</b>
Print Address Slip for sending Documents to commission [Only for Direct Recruitment]
<b>DOWNLOAD SEGMENT</b>
Download Admit Card
Download interview letter
Download Syllabus
Know your Registration No.
Click here to view Key Answer Sheet

**Regarding Application :**

1. On clicking "View Application status" option in Candidate Segment page you can see current status of candidate.
2. On clicking "Result" option in Candidate Segment page candidate can see result status of periodically.
3. "Interview/Exam Schedule" option in Candidate Segment page candidate can see interview and examination schedule details periodically.
4. On clicking "Key Answer Sheet" candidate can download key answer sheet.
5. On clicking "Admit Card/Hall Ticket" candidate can download their Admit Card using with some basic credential of candidate.
6. On clicking "List of Rejected Candidate" candidate can view Rejected candidate list.
7. On clicking "Syllabus" candidate can view syllabus of particular examination.

[Candidates applying on-line need NOT send hard copy of the Online Application filled by them on-line or any other document/certificate/testimonial to the Uttar Pradesh Public Service Commission. However they are advised to take printout of the On-line Application and retain it for further communication with the UPPSC.] [The Candidates applying for the examination should ensure that they fulfill all eligibility conditions for admission to examination. Their admission at all the stages of the examination will be purely provisional subject to satisfying the prescribed eligibility conditions.] UPPSC takes up verification of eligibility conditions with reference to original documents at subsequent stages of examination process.

**LAST DATE FOR RECEIPT OF APPLICATIONS :** On-line Application process must be completed (including filling up of Part-I, Part-II and Part-III of the Form) before last date of form submission according to Advertisement, after which the Web-Link will be disabled.

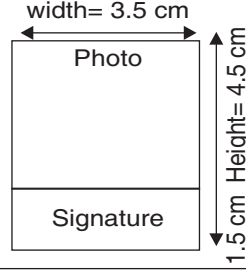
**परिशिष्ट-1**

The Procedure relating to upload Photo & Signature.

**Guide Lines for Scanning Photograph with Signature**

1. Paste the Photo on any white paper as per the above required dimensions. Sign in the Signature Space provided. Ensure that the signature is within the box.
2. Scan the above required size containing photograph and signature. Please do not scan the complete page.
3. The entire image (of size 3.5 cm by 6.0 cm) consisting of the photo along with the signature is required to be scanned, and stored in \*.jpg, .jpeg, .gif, .tif, .png format on local machine.
4. Ensure that the size of the scanned image is not more than 50 KB.
5. If the size of the file is more than 50 KB, then adjust the settings of the scanner such as the DPI resolution, no. colours etc., during the process of scanning.
6. The applicant has to sign in full in the box provided. Since the signature is proof of identity, it must be genuine and in full; initials are not sufficient. Signature in CAPITAL LETTERS is not permitted.
7. The signature must be signed only by the applicant and not by any other person.
8. The signature will be used to put on the Hall Ticket and wherever necessary. If the Applicant's signature on answer script, at the time of the examination, does not match the signature on the Hall Ticket, the applicant will be disqualified.

**Sample Image & Signature :-**



**परिशिष्ट - 2**

The name of districts where Exam will be held are **Lucknow and Prayagraj.**

The No. of Districts/Centers may be increased or decreased according to the decision of commission on the basis of final No. of applications received.

**परिशिष्ट - 3**

**उ0प्र0 की अनुसूचित जाति तथा अनुसूचित जनजाति के लिये जाति प्रमाण-पत्र**

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... सुपुत्र/सुपुत्री श्री ..... निवासी ग्राम ..... तहसील ..... नगर ..... जिला ..... उत्तर प्रदेश राज्य की ..... जाति के व्यक्ति हैं जिसे संविधान (अनुसूचित जाति) आदेश, 1950 (जैसा कि समय-समय पर संशोधित हुआ) / संविधान (अनुसूचित जनजाति, उत्तर प्रदेश) आदेश, 1967 के अनुसार अनुसूचित जाति/अनुसूचित जनजाति के रूप में मान्यता दी गई है।

श्री/श्रीमती/कुमारी ..... तथा अथवा उनका परिवार उत्तर प्रदेश के ग्राम ..... तहसील ..... नगर ..... जिला ..... में सामान्यतया रहता है। स्थान ..... हस्ताक्षर ..... दिनांक ..... पूरा नाम ..... मुहर ..... पद नाम ..... जिलाधिकारी/अतिरिक्त जिलाधिकारी/सिटी मजिस्ट्रेट/परगना मजिस्ट्रेट/तहसीलदार/ अन्य वेतन भोगी मजिस्ट्रेट यदि कोई हो/जिला समाज कल्याण अधिकारी

**उत्तर प्रदेश के अन्य पिछड़े वर्ग के लिए जाति प्रमाण-पत्र**

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... सुपुत्र/सुपुत्री श्री ..... निवासी ग्राम ..... तहसील ..... नगर ..... जिला ..... उत्तर प्रदेश राज्य की ..... पिछड़ी जाति के व्यक्ति हैं। यह जाति उत्तर प्रदेश लोक सेवा (अनुसूचित जातियों, अनुसूचित जनजातियों तथा अन्य पिछड़े वर्गों के लिये आरक्षण) अधिनियम, 1994 (यथासंशोधित) की अनुसूची-एक के अन्तर्गत मान्यता प्राप्त है।

यह भी प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... पूर्वोक्त अधिनियम, 1994 (यथासंशोधित) की अनुसूची-दो (जैसा कि उत्तर प्रदेश लोक सेवा) (अनुसूचित जातियों, अनुसूचित जनजातियों और अन्य पिछड़े वर्गों के लिये आरक्षण) (संशोधन) अधिनियम, 2001 द्वारा प्रतिस्थापित किया गया है एवं जो उत्तर प्रदेश लोक सेवा (अनुसूचित जातियों, अनुसूचित जनजातियों और अन्य पिछड़े वर्गों के लिये आरक्षण) (संशोधन) अधिनियम, 2002 द्वारा संशोधित की गयी है, से आच्छादित नहीं है। इनके माता-पिता की निरंतर तीन वर्ष की अवधि के लिये सकल वार्षिक आय आठ लाख रुपये या इससे अधिक नहीं है तथा इनके पास धनकर अधिनियम, 1957 में यथा विहित छूट सीमा से अधिक सम्पत्ति भी नहीं है।

श्री/श्रीमती/कुमारी ..... तथा/अथवा उनका परिवार उत्तर प्रदेश के ग्राम ..... तहसील ..... नगर ..... जिला ..... में सामान्यतया रहता है। स्थान ..... हस्ताक्षर ..... दिनांक ..... पूरा नाम ..... मुहर ..... पद नाम ..... जिलाधिकारी/अतिरिक्त जिलाधिकारी/सिटी मजिस्ट्रेट/परगना मजिस्ट्रेट/तहसीलदार।

**(प्रपत्र-I)**

**उत्तर प्रदेश सरकार**

**कार्यालय का नाम** .....  
**आर्थिक रूप से कमजोर वर्ग के सदस्य द्वारा प्रस्तुत किया जाने वाला आय एवं परिसम्पत्ति प्रमाण-पत्र**

प्रमाण-पत्र संख्या- ..... दिनांक- .....

**वित्तीय वर्ष ..... के लिए मान्य**

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... पुत्र/पति/पुत्री ..... ग्राम/कस्बा ..... पोस्ट ऑफिस ..... थाना ..... तहसील ..... जिला ..... राज्य ..... पिनकोड ..... के स्थायी निवासी हैं, जिनका फोटोग्राफ नीचे अभिप्रमाणित है, आर्थिक रूप से कमजोर वर्ग के सदस्य हैं, क्योंकि वित्तीय वर्ष ..... में इनके परिवार की कुल वार्षिक आय 8 लाख (आठ लाख रुपये मात्र) से कम है। इनके परिवार के स्वामित्व में निम्नलिखित में से कोई भी परिसम्पत्ति नहीं है:-

- 5 (पाँच) एकड़ कृषि योग्य भूमि अथवा इससे ऊपर।
  - एक हजार वर्ग फीट अथवा इससे अधिक क्षेत्रफल का प्लैट।
  - अधिसूचित नगरपालिका के अन्तर्गत 100 वर्ग गज अथवा इससे अधिक का आवासीय भूखण्ड।
  - अधिसूचित नगरपालिका से इतर 200 वर्ग गज अथवा इससे अधिक का आवासीय भूखण्ड।
2. श्री/श्रीमती/कुमारी ..... जाति ..... के सदस्य हैं, जो अनुसूचित जाति, अनुसूचित जनजाति तथा अन्य पिछड़े वर्गों के रूप में अधिसूचित नहीं हैं।

हस्ताक्षर ..... (कार्यालय का मुहर सहित)  
पूरा नाम .....  
पदनाम .....  
जिलाधिकारी/अतिरिक्त जिलाधिकारी/सिटी मजिस्ट्रेट/परगना मजिस्ट्रेट/तहसीलदार।

**(प्रपत्र-II)**

**आर्थिक रूप से कमजोर वर्ग के लाभार्थ स्वयं घोषणा पत्र**

**स्वयं घोषणा पत्र**

मैं ..... पुत्र/पुत्री/पत्नी ..... ग्राम/कस्बा ..... पोस्ट ऑफिस ..... थाना ..... ब्लॉक ..... तहसील ..... जिला ..... राज्य ..... ने आर्थिक रूप से कमजोर वर्ग के प्रमाण पत्र हेतु आवेदन दिया है, एतद्वारा घोषणा करता/करती हूँ:-

1. मैं ..... जाति से सम्बन्ध रखता/रखती हूँ, जो उत्तर प्रदेश हेतु अधिसूचित अनुसूचित जाति, अनुसूचित जनजाति एवं अन्य पिछड़ा वर्ग की सूची में सूचीबद्ध नहीं है।
2. मेरे परिवार की कुल स्रोतों (वेतन, कृषि, व्यवसाय, पेशा इत्यादि) से कुल वार्षिक आय रु. .... (शब्दों में) है।



3. मेरे परिवार के पास उल्लिखित आय के सिवाय अथवा इसके अतिरिक्त अन्यत्र कोई परिसम्पत्ति नहीं है।

**अथवा**

कई स्थानों पर स्थित परिसम्पत्तियों को जोड़ने के पश्चात् भी मैं (नाम) ..... आर्थिक रूप से कमजोर वर्ग के दायरे में आता/आती हूँ।

4. मैं घोषणा करता/करती हूँ कि मेरे परिवार की सभी परिसम्पत्तियों को जोड़ने के पश्चात् निम्नलिखित में से किसी भी सीमा से अधिक नहीं है—

I. 5 (पाँच) एकड़ कृषि योग्य भूमि अथवा इससे ऊपर।

II. एक हजार वर्ग फीट अथवा इससे अधिक क्षेत्रफल का प्लैट।

III. अधिसूचित नगरपालिका के अन्तर्गत 100 वर्ग गज अथवा इससे अधिक का आवासीय भूखण्ड।

IV. अधिसूचित नगरपालिका से इतर 200 वर्ग गज अथवा इससे अधिक का आवासीय भूखण्ड।

मैं प्रमाणित करता/करती हूँ कि मेरे द्वारा उपरोक्त जानकारी मेरे ज्ञान और विश्वास के अनुसार सत्य है और मैं आर्थिक रूप से कमजोर वर्ग के लिए आरक्षण सुविधा प्राप्त करने हेतु पात्रता धारण करता/करती हूँ। यदि मेरे द्वारा दी गई जानकारी असत्य/गलत पायी जाती है तो मैं पूर्ण रूप से जानता/जानती हूँ कि इस आवेदन पत्र के आधार पर दिये गये प्रमाण पत्र के द्वारा शैक्षणिक संस्थान में लिया गया प्रवेश/लोक सेवाओं एवं पदों में प्राप्त की गई नियुक्ति निरस्त कर दी जायेगी/कर दिया जायेगा अथवा इस प्रमाण पत्र के आधार पर कोई अन्य सुविधा/लाभ प्राप्त किया गया है उससे भी वंचित किया जा सकेगा और इस सम्बन्ध में विधि एवं नियमों के अधीन मेरे विरुद्ध की जाने वाली कार्यवाही के लिए मैं उत्तरदायी रहूँगा/रहूँगी।

**नोट:**— जो लागू नहीं हो उसे काट दें।

आवेदक/आवेदिका का हस्ताक्षर तथा पूरा नाम।

स्थान :-

दिनांक :-

**उ.प्र. के दिव्यांग के लिए प्रमाण-पत्र**

**DISABILITY CERTIFICATE FOR PHYSICALLY HANDICAP OF U.P.  
NAME & ADDRESS OF THE INSTITUTE/HOSPITAL**

Certificate No. ....

Date .....

**DISABILITY CERTIFICATE**

Recent photograph of the candidate showing the disability duly attested by the Chairperson of the Medical Board

This is to certified that Shri/Smt/Kum. .... son/wife/daughter of Shri ..... age ..... Sex ..... identification mark (s) ..... is suffering from permanent disability of following category.

**A. Locomotor or cerebral palsy:**

(i) BL-Both legs affected but not arms.

(ii) BA-Both arms affected

(a) Impaired reach

(b) Weakness or grip

(iii) BLA-Both legs and both arms affected

(iv) OL-One leg affected (right or left)

(a) Impaired reach

(b) Weakness of grip

(c) Ataxic

(v) OA-One arm affected

(a) Impaired reach

(b) Weakness of grip

(c) Ataxic

(vi) BH-Stiff back and hips (Cannot sit or stood)

(vii) MW- Muscular weakness and limited physical endurance

**B. Blindness or Low Vision:**

(i) B-Blind

(ii) PB-Partially Blind

**C. Hearing impairment:**

(i) D-Deaf

(ii) PD-Partially Deaf

(Delete the category whichever is not applicable)

2. This condition is progressive/non-progressive/likely to improve/ not likely to improve. Re-assessn of this case is not recommended/is recommended after a period of ..... year ..... months.

3. Percentage of disability in his/her case is ..... percent.

4. Sh./Smt./Kum. .... meets the following physical requirements discharge of his/her duties:

- |  |        |
|--|--------|
| (i) F-can perform work by manipulating with fingers. | Yes/No |
| (ii) PP-can perform work by pulling & pushing.       | Yes/No |
| (iii) L-can perform work by lifting.                 | Yes/No |
| (iv) KC-can perform work by kneeling and crouching.  | Yes/No |
| (v) B-can perform work by bending.                   | Yes/No |
| (vi) S-can perform work by sitting.                  | Yes/No |
| (vii) ST-can perform work by standing.               | Yes/No |
| (viii)W-can perform work by walking                  | Yes/No |
| (ix) SE-can perform work by seeing.                  | Yes/No |
| (x) H-can perform work by hearing/speaking.          | Yes/No |
| (xi) RW-can perform work by reading and writing.     | Yes/No |

(Dr. ....)  
Member  
Medical Board

(Dr. ....)  
Member  
Medical Board

(Dr. ....)  
Chairperson  
Medical Board

Countersigned by the  
Medical Superintendent/  
CMO/HQ Hospital  
(with seal)

Strike out which is not applicable.

उ.प्र. लोक सेवा (शारीरिक रूप से विकलांग, स्वतंत्रता संग्राम सेनानियों के आश्रितों और भूतपूर्व सैनिकों के लिए आरक्षण) अधिनियम 1993 (यथासंशोधित) के अनुसार स्वतंत्रता

**संग्राम सेनानी के आश्रित के लिए प्रमाण-पत्र**

**प्रमाण-पत्र**

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... निवासी ..... ग्राम ..... तहसील ..... नगर ..... जिला ..... उत्तर प्रदेश लोक सेवा (शारीरिक रूप से विकलांग, स्वतंत्रता संग्राम सेनानियों के आश्रित और भूतपूर्व सैनिक के लिए आरक्षण) अधिनियम 1993 के अनुसार स्वतंत्रता संग्राम सेनानी हैं और श्री/श्रीमती/कुमारी (आश्रित) ..... पुत्र/पुत्री/पौत्र (पुत्र का पुत्र या पुत्री का पुत्र)/पौत्री (पुत्र की पुत्री या पुत्री का पुत्री) (विवाहित अथवा अविवाहित) उपरोक्त अधिनियम 1993 (यथासंशोधित) के प्रावधानों के अनुसार उक्त श्री/श्रीमती (स्वतंत्रता संग्राम सेनानी) ..... के आश्रित हैं।

हस्ताक्षर .....

पूरा नाम .....

मुहर .....

जिलाधिकारी .....

सील .....

**कुशल खिलाड़ियों के लिये प्रमाण-पत्र जो उ.प्र. के मूल निवासी हैं  
शासनादेश संख्या-22/21/1983-कार्मिक-2 दिनांक 28 नवम्बर, 1985  
प्रमाण-पत्र के फार्म - 1 से 4 प्रारूप -1**

(मान्यता प्राप्त क्रीड़ा/खेल में अपने देश की ओर से अन्तर्राष्ट्रीय प्रतियोगिता में भाग लेने वाले खिलाड़ी के लिये)

सम्बन्धित खेल की राष्ट्रीय फेडरेशन/राष्ट्रीय एसोसिएशन का नाम ..... राज्य सरकार की सेवाओं/पदों पर नियुक्ति के लिए कुशल खिलाड़ियों के लिए प्रमाण-पत्र

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... आत्मज/पत्नी/आत्मजा श्री ..... निवासी ..... पूरा पता ..... ने दिनांक ..... से दिनांक ..... तक ..... (स्थान का नाम) में आयोजित ..... (क्रीड़ा/खेल-कूद का नाम) की प्रतियोगिता/टूर्नामेंट में देश की ओर से भाग लिया।

उनके टीम के द्वारा उक्त प्रतियोगिता/टूर्नामेंट में ..... स्थान प्राप्त किया गया।

यह प्रमाण-पत्र राष्ट्रीय फेडरेशन/राष्ट्रीय एसोसिएशन/(यहाँ संस्था का नाम दिया जाये) ..... में उपलब्ध रिकार्ड के आधार पर दिया गया है।

स्थान ..... हस्ताक्षर .....

दिनांक ..... नाम .....

पद .....

संस्था का नाम .....

मुहर .....

**नोट :** यह प्रमाण-पत्र नेशनल फेडरेशन/नेशनल एसोसिएशन के सचिव द्वारा व्यक्तिगत रूप से किये गये हस्ताक्षर होने पर ही मान्य होगा।

**प्रारूप - 2**

**(मान्यता प्राप्त क्रीड़ा/खेल में अपने प्रदेश की ओर से राष्ट्रीय प्रतियोगिता में भाग लेने वाले खिलाड़ी के लिये)**

सम्बन्धित खेल की प्रदेशीय एसोसिएशन का नाम ..... राज्य सरकार की सेवाओं/पदों पर नियुक्ति के लिए कुशल खिलाड़ियों के लिए प्रमाण-पत्र

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... आत्मज/पत्नी/आत्मजा श्री ..... निवासी (पूरा पता) ..... ने दिनांक ..... से दिनांक ..... तक ..... में (क्रीड़ा/खेल-कूद का नाम) की प्रतियोगिता (टूर्नामेंट स्थान का नाम) ..... आयोजित राष्ट्रीय ..... में (क्रीड़ा/खेल-कूद का नाम) की प्रतियोगिता/टूर्नामेंट में प्रदेश की ओर से भाग लिया।

उनके टीम के द्वारा उक्त प्रतियोगिता/टूर्नामेंट में ..... स्थान प्राप्त किया गया।

यह प्रमाण-पत्र ..... (प्रदेशीय संघ का नाम) में उपलब्ध रिकार्ड के आधार पर दिया गया है।

स्थान ..... हस्ताक्षर .....

दिनांक ..... नाम .....

पद .....

संस्था का नाम .....

पता .....

मुहर .....

**नोट :** यह प्रमाण-पत्र प्रदेशीय खेल-कूद संघ के सचिव द्वारा व्यक्तिगत रूप से किये गये हस्ताक्षर होने पर ही मान्य होगा।

**प्रारूप - 3**

(मान्यता प्राप्त क्रीड़ा/खेल में अपने विश्वविद्यालय की ओर से अन्तर्विश्वविद्यालय प्रतियोगिता में भाग लेने वाले खिलाड़ी के लिये)

विश्वविद्यालय का नाम ..... राज्य स्तर की सेवाओं/पदों पर नियुक्ति के लिए कुशल खिलाड़ियों के लिए प्रमाण-पत्र

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... आत्मज/पत्नी/आत्मजा श्री ..... निवास (पूरा नाम) ..... विश्वविद्यालय की कक्षा ..... के विद्यार्थी ने दिनांक ..... से दिनांक ..... तक ..... (स्थान का नाम) में आयोजित अन्तर्विश्वविद्यालय ..... (क्रीड़ा/खेल-कूद का नाम) प्रतियोगिता/टूर्नामेंट में विश्वविद्यालय की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता/टूर्नामेंट में ..... स्थान प्राप्त किया गया। यह प्रमाण-पत्र डीन ऑफ स्पोर्ट्स अथवा इंचार्ज खेल कूद विश्वविद्यालय में उपलब्ध रिकार्ड के आधार पर दिया गया है।

स्थान ..... हस्ताक्षर .....

दिनांक ..... नाम .....

पद .....

संस्था का नाम .....

मुहर .....

**नोट :** यह प्रमाण-पत्र विश्वविद्यालय के डीन ऑफ स्पोर्ट्स या इंचार्ज खेल-कूद द्वारा व्यक्तिगत रूप से किये गये हस्ताक्षर होने पर ही मान्य होगा।

**प्रारूप - 4**

**(मान्यता प्राप्त क्रीड़ा/खेल में अपने स्कूल की ओर से राष्ट्रीय खेल-कूद में भाग लेने वाले खिलाड़ी के लिये)**

डाइरेक्ट्रेट ऑफ पब्लिक इन्सट्रक्शन्स/निदेशक, शिक्षा, उत्तर प्रदेश ..... राज्य स्तर की सेवाओं/पदों पर नियुक्ति के लिए कुशल खिलाड़ियों के लिए प्रमाण-पत्र

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... आत्मज/पत्नी/आत्मजा श्री ..... निवास (पूरा नाम) ..... में ..... स्कूल में कक्षा

के विद्यार्थी ने दिनांक ..... से दिनांक ..... तक (स्थान का नाम) में आयोजित स्कूलों के नेशनल गेम्स की ..... (क्रीडा/खेल-कूद का नाम) प्रतियोगिता/टूर्नामेन्ट में ..... स्कूल की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता/टूर्नामेन्ट में ..... स्थान प्राप्त किया गया।

यह प्रमाण-पत्र डाइरेक्ट्रेट ऑफ पब्लिक इन्सट्रक्शन्स/शिक्षा में उपलब्ध रिकार्ड के आधार पर दिया गया है।

स्थान ..... हस्ताक्षर .....  
दिनांक ..... नाम .....  
पद .....  
संस्था का नाम .....  
मुहर .....

**नोट :** यह प्रमाण-पत्र निदेशक/या अतिरिक्त/संयुक्त या उपनिदेशक डाइरेक्ट्रेट ऑफ पब्लिक इन्सट्रक्शन्स/शिक्षा ..... द्वारा व्यक्तिगत रूप से हस्ताक्षर होने पर मान्य होगा।

**परिशिष्ट-4**

**परीक्षा योजना एवं पाठ्यक्रम**

**सम्मिलित राज्य अभियन्त्रण सेवा परीक्षा हेतु वस्तुनिष्ठ प्रकार के निम्नवत दो प्रश्न-पत्र होंगे:-**

**प्रथम प्रश्न पत्र**

विषय	प्रश्नों की संख्या	अंक	कुल अंक	समय
1- सामान्य हिन्दी	25 (प्रत्येक प्रश्न 3 अंक)	75	375	2.30 (ढाई) घण्टा
2- मुख्य विषय ( सिविल इंजी0-1, मैके0 इंजी0-1, विद्युत इंजी0-1, कृषि इंजी0-1, केमिकल इंजी0-1, इण्डस्ट्रियल इंजी0-1, फायर इंजी0-1, हाइड्रॉलिकस इंजी0-1, इलेक्ट्रानिकस इंजी0-1)	100 (प्रत्येक प्रश्न 3 अंक)	300		

**द्वितीय प्रश्न पत्र**

विषय	प्रश्नों की संख्या	अंक	कुल अंक	समय
1- सामान्य अध्ययन	25 (प्रत्येक प्रश्न 3 अंक)	75	375	2.30 (ढाई) घण्टा
2- मुख्य विषय ( सिविल इंजी0-11, मैके0 इंजी0-11, विद्युत इंजी0-11, कृषि इंजी0-11, केमिकल इंजी0-11, इण्डस्ट्रियल इंजी0-11, फायर इंजी0-11, हाइड्रॉलिकस इंजी0-11, इलेक्ट्रानिकस इंजी0-11)	100 (प्रत्येक प्रश्न 3 अंक)	300		

**व्यक्तित्व परीक्षा (साक्षात्कार)** - 100 अंक

**कुल योग** - 375 + 375 + 100 = 850 अंक

**पाठ्यक्रम**

**सामान्य हिन्दी-** हिन्दी का पाठ्यक्रम इस प्रकार बनाया जायेगा ताकि उम्मीदवार की हिन्दी भाषा की समझ और शब्दों के कुशल प्रयोग की जाँच हो सके। इसका स्तर हाई स्कूल का होगा।

**सामान्य अध्ययन:** सामान्य अध्ययन के प्रश्न-पत्र समसामयिक घटनाओं और ऐसी बातों की उनके वैज्ञानिक पहलुओं पर ध्यान देते हुए जानकारी सम्मिलित होगी जो प्रतिदिन के अनुभव में आती है तथा जिनकी किसी शिक्षित व्यक्ति से अपेक्षा की जा सकती है। प्रश्न-पत्र में भारत का इतिहास, राजनीति और भूगोल के ऐसे प्रश्न भी सम्मिलित होंगे जिनका उत्तर उम्मीदवार विशेष अध्ययन किये बिना ही दे सकेंगे।

**CIVIL ENGINEERING**

**PAPER - 1**

**PART - A**

**ENGINEERING MECHANICS, STRENGTH OF MATERIALS AND STRUCTURAL ANALYSIS.**

Units and Dimensions, SI units, vectors, concept of force, Concept of particle and rigid body Concurrent, Non- Concurrent and parallel forces in a plane, moment of force and varignon's theorem free body diagram, conditions of equilibrium Principle of virtual work, equivalent force system.

First and second Moment of area, Mass moment of inertia, Static Friction, inclined plane and bearings, kinematics and kinetics, kinematics in Cartesian and Polar Coordinates, motion under uniform and non-uniform acceleration, motion under gravity, Kinetics of particle: Momentum and Energy principles, D' Alembert's principle, Collision of elastic bodies, rotation of rigid, bodies, simple harmonic motion.

**STRENGTH OF MATERIALS:**

Simple Stress and Strain, Elastic constants, axially loaded compression members, Shear force and bending moment, theory of simple bending, bending stress, Shear Stress, Beams of uniform strength, Leaf Spring, close coiled helical springs, Strain Energy in direct stress, bending & shear. Deflection of beams; Macaulay's method, Mohr's Moment area method, Conjugate beam method, unit load method, Torsion of shafts, Transmission of power, Elastic stability of columns, Euler's Rankin's and Secant formulae. Principal stresses and strains in two dimensions, Mohr's Circle, Theories of Elastic Failure, Thin and Thick cylinder, Stresses due to internal and external pressure-Lame's equations.

**STRUCTURAL ANALYSIS:**

Castiglianos theorems I and II, Unit load method of consistent deformation applied to beams and pin jointed trusses. Slope-deflection, moment distribution, Kani's method of analysis and column Analogy method applied to indeterminate beams and rigid frames. Rolling loads and influence lines: Influence lines for reactions of beam, shear force and bending moment at a section of beam. Criteria for maximum shear force and bending moment in beams traversed by a system of moving loads, influence lines for simply supported plane pin jointed trusses, Arches: Three hinged, two hinged and fixed arches, rib shortening and temperature effects, influence lines in arches, Matrix methods of analysis: Force method and displacement method of analysis of indeterminate beams and rigid frames. Plastic Analysis of beams and frames: Theory of plastic bending, plastic analysis, statical method, Mechanism method. Unsymmetrical bending: Moment of inertia, product of inertia, position of neutral axis and principal axis, calculation of bending stresses.

**PART - B**

**DESIGN OF STRUCTURES: STEEL, CONCRETE AND MASONRY STRUCTURES.**

**STRUCTURAL STEEL DESIGN:**

**Structural steel:** Factors of safety and load factors, rivetted, bolted and welded joints and its connections, Design by working, stress/limit state method of tension and compression member, beams of built up section, rivetted and welded plate girders, gantry girders,

stanchions with battens and lacings, slab and gusseted column bases, Design of highway and railway bridges: Through and deck type plate girder, Warren girder, Pratt truss.

**DESIGN OF CONCRETE AND MASONRY STRUCTURES:**

**Reinforced Concrete:** Working Stress and Limit State Method of design-Recommendations of B.I.S. codes, design of one way and two way slabs, stairs-case slabs, simple and continuous beams of rectangular, T and L sections, compression members under direct load with or without eccentricity, isolated and combined footings, Cantilever and counter-fort type retaining walls, Water tanks: Design requirements as per B.I.S. code for rectangular and circular tanks resting on ground, Prestressed concrete: Methods and systems of prestressing, anchorages, analysis and design of sections for flexure based on working stress, losses of prestress, Earth quake resistant design of building as per BIS code. Design of brick masonry as per I. S. Codes, Design of masonry retaining walls.

**PART - C**

**Building Materials, Construction Technology, Planning and Management**

**Building Materials:** Physical properties of construction materials with respect to their use: stones bricks, tiles, lime, glass, cement, mortars, Concrete, concept of mix design, pozzolans, plasticizers, super plasticizers, Special concrete: roller compacted concrete, mass concrete, self compacting concrete, ferro cement, fibre reinforced concrete, high strength concrete, high performance concrete, Timber: properties, defects and common preservation treatments, Use and selection of materials for various uses e.g. Low cost housing, mass housing, high rise buildings.

**Constructions Technology, Planning and Management:**

Masonry constructions using brick, stone, construction detailing and strength characteristics paints, varnishes, plastics, water proofing and damp proofing materials. Detailing of walls, floors, roofs, staircases, doors and windows. Plastering, pointing, flooring, roofing and construction features. Retrofitting of buildings, Principle of planning of building for residents and specific uses, National Building code provisions and uses. Basic principles of detailed and approximate estimating, specifications, rate analysis, principles of valuation of real property. Machinery for earthwork, concreting and their specific uses, factors affecting selection of construction equipments, operating cost of equipments. Construction activity, schedules, organizations, quality assurance principles. Basic principle of network CPM and PERT uses in construction monitoring, cost optimization and resource allocation. Basic principles of economic analysis and methods. Project profitability: Basis principles of financial planning, simple toll fixation criterions.

**PART - D**

**GEO TECHNICAL ENGINEERING AND FOUNDATION ENGINEERING**

Types of soils, phase relationships, consistency limits particles size distribution, classifications of soils, structure and clay mineralogy. Capillary water, effective stress and pore water pressure, Darcy's Law, factors affecting permeability, determination of permeability, permeability of stratified soil deposits. Seepage pressure, quick sand condition, compressibility and consolidation, Terzaghi's theory of one dimensional consolidation, consolidation test.

Compaction of soil, field control of compaction total stress and effective stress parameters, pore pressure parameters, shear strength of soils, Mohr Coulomb failure theory, shear tests.

Earth pressure at rest, active and passive pressures, Rankin's theory Coulomb's wedge theory, Graphical method of earth pressure on retaining wall, sheetpile walls, braced excavation, bearing capacity, Terzaghi and other important theories, net and gross bearing pressure.

Immediate and consolidation settlement, stability of slope, total stress and effective stress methods, conventional methods of slices, stability number.

Subsurface exploration, methods of boring, sampling, penetration tests, pressure meter tests, essential features of foundation, types of foundation, design criteria, choice of type of foundation, stress distribution in soils, Boussinessq's theory, Westergaard method, Newmarks chart, pressure bulb, contact, pressure, applicability of different bearing capacity theories, evaluation of bearing capacity from filed tests, allowable bearing capacity, settlement analysis, allowable settlement, proportioning of footing, isolated and combined footings, rafts, pile foundation, types of piles, plies capacity, static and dynamic analysis, design of pile groups, pile load test, settlement of piles lateral loads, foundation for bridges, Ground improvement techniques: sand drains, stone columns, grouting, soil stabilization geotextiles and geomembrane, Machine foundation: Natural frequency, design of machine foundations based on the recommendation of B.I.S. codes.

**CIVIL ENGINEERING PAPER- II**

**Part - A**

**FLUID MECHANICS, OPEN CHANNEL FLOW, HYDRAULIC MACHINES AND HYDROPOWER ENGINEERING.**

**Fluid Mechanics:** Fluid properties and their roles in fluid motion, fluid statics including forces acting on plane and curved surfaces, Kinematics and Dynamics of Fluid flow: Velocity and acceleration, stream lines, equation of continuity, irrotational and rotational flow, velocity potential and stream functions, flownet, methods of drawing flownet, source and sink, flow separation, free and forced vorties.

Flow control volume equation, continuity, momentum and energy equations, Navier-Stokes equation, Euler's equation of motion and application to fluid flow problems, pipe flow, plane, curved, stationary and moving vanes sluice gates, weirs, orifice meters and Venturi meters.

Dimensional Analysis and Similitude: Buckingham's Pi-theorem, dimensionless parameters, similitude theory, model laws, undistorted and distorted models.

**Laminar Flow:** Laminar flow between parallel, stationary and moving plates, flow through pipes.

**Boundary Layer:** Laminar and turbulent boundary layer on a flat plate, laminar sub-layer, smooth and rough boundaries, submerged flow, drag and lift and its applications.

**Turbulent flow through pipes:** Characteristics of turbulent flow, velocity distribution, pipe friction factor, hydraulic grade line and total energy line, siphons, expansion and contractions in pipes pipe networks, water hammer in pipes and surge tanks.

**Open Channel Flow:** Flow types, uniform and nonuniform flows, momentum and energy correction factors, Specific energy and specific force, critical depth, resistance equations and roughness coefficient, rapidly varied flow, flow in transitions, Brink flow, Hydraulic jump and its applications, waves and surges, gradually varied flow, classification of surface profiles, control section, Integration of varied flow equation and their solution.

**HYDRAULIC MACHINES AND HYDROPOWER:**

Centrifugal pumps-Types, characteristics, Net Positive Suction-head (NPSH), specific



speed, Pumps in series and parallel.

Reciprocating pumps, Air vessels, Hydraulic ram, efficiency parameters, Rotary and positive displacement pumps, diaphragm and jet pumps.

**Hydraulic turbines:** types, classification, Choice of turbines, performance parameters, controls, characteristics, specific speed.

**Principles of hydropower development:** Types, layouts and component works, surge tanks, types and choice, Flow duration curves and dependable flow, Storage and pondage, Pumped storage plants, Special types of hydel plants.

#### **Part – B**

##### **Hydrology and Water Resources Engineering**

**Hydrology:** Hydrologic cycle, precipitation, evaporation, transpiration, infiltration, overland flow, hydrographs, flood frequency analysis, flood routing through a reservoir, channel flow routing- Muskingam method.

**Ground Water flow:** Specific yield, storage coefficient, coefficient of permeability, confined and unconfined aquifers, radial flow into a well under confined and unconfined conditions, Open wells and tube wells.

Ground and surface water recourses single and multipurpose projects, storage capacity of reservoirs, reservoir losses, reservoir sedimentation.

Water requirements of crops consumptive use, duty and delta, irrigation methods, Irrigation efficiencies.

**Canals:** Distribution systems for cannal irrigation, canal capacity, canal losses, alignment of main and distributory canals, Design of cannal by Kennedy's and Lacey's theories, Water logging and its prevention.

**Diversion head works:** Components, Principles and design of weirs on permeable and impermeable foundations, Khosla's theory, Bligh's creep theory Storage works.

Cross drainage works.

Types of dams, design principles of gravity and earth dams, stability analysis. Spillways: Spillway types energy dissipation.

**River training:** Objectives of river training, methods of river training and bank protection.

#### **Part – C**

##### **Transportation Engineering**

**Highway Engineering:** Principles of Highway alignments, classification and geometric design, elements and standards for roads.

Pavement: flexible and rigid pavements Design principles and methodology. Construction methods and materials for stabilized soil. WBM, Bituminous works and Cement Concrete roads.

Surface and sub-surface drainage arrangements for roads, culvert structures. Pavement distresses and strengthening by overlays.

Traffic surveys and their application in traffic planning, Typical design features for channelized, intersection, rotary etc., signal designs, standard traffic signs and markings.

**Railway Engineering:** Permanent way, ballast, sleeper, chair and fastenings, points, crossings, different types of turn outs, cross-over, setting out of points, Maintenance of track, super elevation, creep of rails ruling gradients, track resistance tractive effort, curve resistance, Station yards and station buildings, platform sidings, turn outs, Signals and interlocking, level crossings.

**Air port Engineering:** Layouts, Planning and design.

#### **Part – D**

##### **Environmental Engineering**

**Water supply:** Estimation of water demand, impurities in water and their significance, physical, chemical and bacteriological parameters and their analysis, waterborne diseases, standards for potable water.

**Water collection & treatment:** Intake structures, principles and design of sedimentation tank, coagulation cum flocculation units slow sand filter, rapid sand filter and pressure filter, theory & practices of chlorination, water softening, removal of taste and salinity, Sewerage Systems, Domestic and industrial wastes, storm, sewage, separate and combined systems, flow through sewers, design of sewers.

**Waste water characterization:** Solids, Dissolved oxygen (DO), BOD COD, TOC, and Nitrogen, Standards for disposal of effluent in normal water course and on to land.

**Waste water treatment:** Principles and design of wastewater Treatment units-- Screening, grit chamber, sedimentation tank activated sludge process, trickling filters, oxidation ditches, oxidation ponds, septic tank; Treatment and disposal of sludge; recycling of waste water.

**Solid waste management:** Classification, Collection and disposal of solid waste in rural and urban areas, Principles of solid waste management.

**Environmental pollution:** Air and water pollution and their control acts. Radioactive waste and their disposal Environmental impact assessment of Thermal power Plants, mines and river valley projects, Sustainable development.

#### **Part – E**

##### **Survey and Engineering Geology**

(a) **Surveying:** Common methods and instruments for distance and angle measurements in Civil Engineering works, their use in plane table traverse survey, levelling, triangulation, contouring and topographical maps. Survey layouts for culverts canal, bridge, roads, railway alignment and buildings.

Basic principles of photogrammetry and remote sensing.

Introduction to Geographical information system.

##### **Engineering Geology**

Basic concepts of Engineering geology and its applications in projects such as dams, bridges and tunnels.

#### **MECHANICAL ENGINEERING**

##### **PAPER-I**

###### **1. Engineering Mechanics:**

Analysis of force systems, friction, centroid and centre of gravity, trusses and beams, principle of virtual work, kinematics and kinetics of particle, kinematics and kinetics of rigid bodies.

###### **2. Mechanism and Machines:**

Velocity and acceleration of links, cams and followers gears and gear trains clutches, belt drives, brakes and dynamometers, Flywheel and governors, balancing of rotating and reciprocating masses, balancing of multi cylinder engines, Free and forced vibration, damped vibration, whirling of shafts.

###### **3. Mechanics of Solids:**

Stresses and strains, compound stresses strains, Torsion of circular shafts, stresses and

deflections in beams unsymmetrical bending, curved beams, Thin and thick cylinders and spheres, Buckling of columns, Energy methods, helical and leaf springs.

###### **4. Design of Machine Elements:**

Design for Static and dynamic loading, Theories of failure, fatigue principles of design of rivetted, welded and bolted joints, shafts, springs, bearings, brakes, clutches and flywheels.

###### **5. Engineering Materials:**

Crystal systems and crystallography, crystal imperfections, Alloys and phase diagrams, Heat treatment, ferrous and non ferrous metals and alloys, Mechanical properties and testing.

###### **6. Manufacturing:**

Metal casting, metal forming, metal joining, Mechanics of metal cutting, machining and machine tool operations, unconventional machining methods limits, fits and tolerances, inspection: Surface roughness, comparators, computer integrated manufacturing, Flexible manufacturing systems, jigs and fixtures

###### **7. Industrial Engineering:**

Production, planning and control, inventory control and operation, research, CPM and PERT.

###### **8. Mechatronics and Robotics:**

Microprocessors and microcontrollers, Architecture, Programming, Computer interfacing Programmable logic controller, sensors and actuators, Piezoelectric accelerometers, Hall effect sensors, optical encoder, resolver, Inductosyn, Pneumatic and Hydraulic Actuators, stepper motor, control system, mathematical modeling, control signals, controllability and observability, Robotics: Robot classification, robot specification. Notation: Direct and inverse kinematics homogeneous co-ordinates and arm equation of four axis SCARA Robot.

#### **MECHANICAL ENGINEERING**

##### **PAPER-II**

###### **1. Thermodynamics:**

Thermodynamic systems and processes, properties of pure substances, concepts and applications of zeroth, first and second law of thermodynamics, entropy, availability and irreversibility, detailed analysis of thermodynamic cycles, ideal and real gases, fuels and combustion.

###### **2. Fluid Mechanics:**

Basic concepts and properties of fluids, manometry, fluid statics, buoyancy, equations of motion, Bernoulli's equation and applications, viscous flow of incompressible fluids, laminar and turbulent flows, flow through pipes and head losses in pipes, dimensional analysis, Forces on immersed bodies and boundary layer over a flat plate, isentropic and adiabatic flows, normal shock waves.

###### **3. Heat Transfer:**

Modes of heat transfer, steady and unsteady heat conduction, thermocouple time constant, critical thickness of insulation, heat transfer from fins, momentum and energy equations for boundary layer flow on a flat plate. Free and forced convection, radiation heat transfer, Stefan-Boltzmann law, shape factor, black and grey body radiation heat exchange, boiling and condensation, heat exchanger analysis, LMTD and NTU – effectiveness methods.

###### **4. Energy conversion:**

SI and CI engines, performance characteristics and testing of IC engines, combustion phenomena in SI and CI engines, carburetion and fuel injection systems, emissions and emission control. Reciprocating and rotary pumps, pelton wheel, Francis and Kaplan turbines, velocity diagrams impulse and reaction principles steam and gas turbines; Rankine and Brayton cycles with regeneration and reheat, high pressure boilers, draft, condensers. Unconventional power systems, including nuclear, MHD, biomass, wind and tidal systems, utilization of solar energy; Reciprocating and rotary compressors; theory and applications, Theory of propulsions, pulsejet and ramjet engines.

###### **5. Environmental control:**

Vapour compression, vapour absorption, steam jet and air refrigeration systems, properties of refrigerant and their nomenclature, psychometrics properties and processes, psychrometric relations, use of psychrometric chart, load estimation, supply air conditions, sensible heat factors, air conditioning system layout, comfort chart, comfort and industrial air conditioning.

#### **ELECTRICAL ENGINEERING**

##### **PAPER – I**

**Networks and Systems:** Steady-state and Transient-state Analysis of systems, Thevenin's-, Norton's-, Superposition- and Maximum Power Transfer-theorems, Driving point Transfer functions, Two-port networks, Laplace and Fourier transforms and their applications in Network analysis, Z-transforms for discrete systems, R-L, R-C & L-C network synthesis.

**E.M. Theory:** Analysis of electrostatic and magnetostatic fields, Laplace, Poisson and Maxwell equations, solution of boundary value problems, electromagnetic wave propagation, ground and space waves, Propagation between Earth Station and Satellites.

**Control systems:** Mathematical modelling of dynamic linear continuous systems, Block diagrams and Signal flow graphs, time-response specifications, steady-state error, Routh-Hurwitz criterion, Nyquist techniques, Root Loci, Bode Plots, Polar Plot, and stability analysis, Lag-, Lead-, Lag-Lead-compensation, state-space modelling, state transition matrix, controllability and observability.

**Elements of Electronics:** Basics of semiconductor diodes, BJT, FET and their characteristics, different types of transistors and FET amplifiers equivalent circuits and frequency response, feedback oscillators, colpitts oscillator and Hartley Oscillator, Operational amplifiers-characteristics and applications.

**Power System Analysis and Design:** Line parameters and calculations, Performance of Transmission lines, Mechanical design of overhead lines and Insulators, Corona and radio interference Parameters of single- and three-core Cables, Bus admittance matrix, Load flow equations and methods of solutions, Fast-decoupled load flow, Balance- and Unbalanced-faults analysis, Power system stability, Power system transients and travelling Waves, EHV Transmission, HVDC transmission, Concepts of FACTS, Voltage Control and Economic operation, Concepts of distributed generation, solar and wind power, smart grid concepts.

**Elements of Electrical Machines:-** General concepts of E.m.f., m.m.f., and torque in rotating machines, DC Machines: motor and generator characteristics, equivalent circuits, commutation and amature reaction, starting and speed controls of motors; Synchronous Machines: performance, regulation, Parallel operation of generators, motor starting, characteristics and applications, Transformers: phasor-diagram and equivalent circuit,



efficiency, and voltage regulation, auto-transformers, 3-phase transformers.

**Measurement:** Basic methods of measurement, Precision and standards, error analysis, Bridges and Potentiometers; moving coil, Moving iron, dynamometer and induction type instruments, measurement of voltage, current, power, energy, and power factor, Instrument transformers, digital voltmeters and multimeters, phase-, time- and frequency-measurement, Q-meters Oscilloscopes, Basics of sensors, and data acquisition system, Instrumentation systems for pressure and temperature measurements.

#### ELECTRICAL ENGINEERING

##### PAPER – II

**Power Electronics and Drives:** Semiconductor, power, diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs static characteristics and principles of operation, triggering circuits single phase and three-phase controlled rectifiers-fully controlled and half controlled, smoothing and filters regulated power supplies, DC-DC choppers and inverters, speed control circuits for DC and A.C. drives, Basics of electric drives: types, quadrant operation, reversing and braking of electric motors, estimation of power ratings, traction motors.

**Digital Electronics:** Boolean algebra, logic gates, combinational and sequential logic circuits, multiplexers, multivibrators, sample and hold circuits, A/D and D/A converters, basics of filter circuits and applications, active filters, semiconductor memories.

**Microwaves and Communication systems:** Electromagnetic wave in guided media, wave guide components, resonators, microwave tubes, microwave generators and amplifiers.

**Analog Communication basics:** modulation and demodulation, noise and bandwidth, transmitters and receivers, signal to noise ratio, digital communication basics, sampling, quantizing, coding frequency- and time-domain multiplexing, sound and vision broadcast, antennas, transmission lines at audio and ultra-high frequencies.

**Induction and special Machines:** Three-phase Induction motors Rotating magnetic field, Torque-slip characteristics, Equivalent Circuit and determination of its parameters, starters, speed control, Induction generators. Single phase Induction motors: Theory and phasor diagrams, characteristics, starting and applications, repulsion motor, series motor: E.m.f. equation and phasor diagram and performance, servomotors, stepper motors, reluctance motors, brushless DC motors (BLDC).

**Power system protection and Switch gear:** Methods of Arc Extinction, Restriking voltages and recovery voltage, testing of circuit breakers, Protective relays, protective schemes for power system equipment, surges in transmission lines and protection.

**Numerical Methods:** Solution of non liner algebraic equations, single and multisteps methods for solution of differential equations.

**Electrical Engineering Materials:** Crystal structure and defects, conducting, insulating and magnetizing Materials, super-conductors.

**Elements of Microprocessors :** Data representation and representation of integer and floating point-numbers. Organization and programming of a microprocessor, ROM and RAM memories CPU of a microcomputer, interfacing memory and I/O devices, Programmable peripheral and communication interface. Application of microprocessors.

#### AGRICULTURAL ENGINEERING

##### PAPER-I

**(a) Thermodynamics and Heat Engines:** Concept of energy, temperature and heat equations; laws of thermodynamics, pure substances and their properties; entropy, Rankine, air standard Otto, Diesel and Joule cycles; indicator diagrams.

**(b) Farm Power:** Sources and status of power in India; farm power and agricultural productivity relationship; construction and operational features of IC engines, various system of IC engine namely carburetion, ignition, cooling, lubrication; valves and valve timing, special features of diesel engines, tractors and their classification, power transmission, repair and maintenance; tractor testing, and tractor economics; power tillers – their economics and suitability, Energy in Agriculture.

**(c) Farm Machinery:** Design, construction, operation, repair and maintenance of tillage tools, implements and equipment viz. mould board and disk plough; harrows, cultivators, rotary tiller, seeding and planting machines, hoe, weeders, sprayers and dusters; harvester, threshers and combines; soil and crop factors influencing machine performance and energy requirements; selection of farm machines, economics of agricultural mechanization. Earth moving machineries.

**(d) Heat and Mass Transfer:** Thermal properties of materials; steady state and transient heat conduction, natural and forced convection; boiling, condensation, thermal radiation exchange, Heat exchangers, heat and mass transfer analogy; Fick's laws of diffusion, psychrometrics; analysis of heat and mass transfer processes, instrument and measurement systems.

**(e) Process and Food Engineering :** Unit operations in post harvest processing (cleaning, grading, drying, size reduction, evaporation, pasteurization, distillation etc.); processing of cereals, pulses, oilseeds, fruits & vegetables, animal feed, spices, dairy products, meat etc.; design of processing equipment and systems, milking machines.

**(f) Storage and handling:** Changes in stored products during storage; storage of food grains and their products, perishables (vegetable, fruits, dairy product, meat and eggs) storage system- air tight ventilated, refrigerated, modified atmospheric and controlled atmospheric storages; packaging; conveyors; design and management of storage and handling systems. Reducing losses in storages and handling.

#### AGRICULTURAL ENGINEERING

##### PAPER-II

**(a) Hydraulics and Fluid Mechanics:** Fluid properties, units and dimensions: surface tension and capillarity, equation of continuity, Bernoulli equation, Laminar and turbulent flow, steady and unsteady flow, Flow of fluids in pipes and open channels, design of open channels for non erosive and non silting velocities, most economical cross section, measurement of irrigation water and other water measuring devices viz. weirs, notches, orifices and flumes.

**(b) Surveying and Leveling:** Linear measurements; survey methods and devices used; principle of leveling, simple, differential and profile leveling; Contouring and characteristics of contour lines; Land leveling and grading, earth work estimation.

**(c) Soil and Water Conservation Engineering:** Forms of precipitation; hydrologic cycle; Point rainfall analysis, frequency analysis, agricultural watershed and its management; water management in agri-horti-aquaculture system, mechanics of water and wind erosion; Rational method of prediction of peak runoff and its limitations; concept of unit hydrograph and instantaneous hydrograph; factors affecting erosion and runoff; water erosion control measures – contour cultivation, strip cropping, terracing, afforestation, pastures; Design of gully control structures – temporary and permanent; stream bank erosion; flood routing; flood amelioration by upstream soil water management; wind

erosion control measures and sand dunes stabilization.

**(d) Irrigation Pumps:** Design, construction, performance characteristics, selection, installation, servicing and maintenance of different pumps (reciprocating, centrifugal, gear, turbine, submersible, propeller, jet); Hydraulic ram; Renewable and non-renewable power sources for pumping solar pumps.

**(e) Irrigation and Drainage Engineering:** Water wealth and irrigation in India; Soil water plant relationship; Forms and occurrence of soil water; methods and devices for soil moisture measurement; water requirement of crops; irrigation scheduling; irrigation methods – their hydraulics and design flood, border, furrow, sprinkler and drip irrigation, concept of irrigation efficiencies; water conveyance and control; Design of canals. Lacey and Kennedy's theories.

Drainage needs and its benefits; Darcy's Law, hydraulic conductivity; drainage coefficient; drainage methods, surface drainage (drainage of flat and sloping lands); design of open ditches their alignment and construction; designs and layout of subsurface drains; depth and spacing of drains and drainage outlets; installation of drains and drainage wells; drainage of salt affected areas.

**(f) Ground Water Hydrology and Tube well Engineering:** Occurrence and movement of ground water, steady and transient flow into wells, well interference, well drilling, design of well assembly and gravel pack, installation of well screen, completion and development of wells.

**(g) Rural Engineering:** Building materials and their properties; Farm stead planning, and design of dairy barns; poultry, goat-sheep, and piggery housing; selection of site, planning and design of rural houses, farm roads, village drainage; waste disposal and sanitary structures; cost estimates, green house construction.

#### INDUSTRIAL ENGINEERING

##### Paper-I

##### PART 'A'

**(A) Statics and Dynamics:** Suspension cables, Friction, Trusses, Principle of virtual work; Kinematics of rigid bodies - plane motion, absolute motion; Kinetics of rigid bodies - plane motion, force, mass and acceleration, work and energy, impulse and momentum.

**(B) Theory of Machines:** Velocity and acceleration of links; Cams; Gears and gear trains; Clutches; Belt drives; Brakes and dynamometers; Flywheel and governors; Balancing of rotating and reciprocating masses and multi-cylinder engines; Free, forced and damped vibrations; Critical speed.

**(C) Mechanics of Solids:** Stress and strain in two dimensions; Mohr's circle; Strain rosettes; Torsion of circular shafts' stresses and deflection due to bending of beams; Castigliano's theorem; Shrink fit; Stability of columns.

**(D) Materials Science:** Atomic structure; Crystal systems; Imperfections; Polymers; Elastomers and ceramics; Mechanical behaviour of materials; True and conventional stress-strain curves for common engineering materials; Strain hardening; Fracture, creep and fatigue.

##### PART 'B'

**(A) Manufacturing Science & Production Processes:** Merchant's theory; Taylor's equation; Machinability; Conventional manufacturing processes - Casting and welding, the related defects; Unconventional manufacturing processes - EDM, ECM and ultrasonic machining; Forming processes - High velocity forming, explosive forming; Surface roughness and its measurement; Gauges, Comparators, Jigs and fixtures.

**(B) Basic Production Management:** Scientific Management; Work analysis - time and motion study, work sampling; Value engineering; Line balancing and work station design.

**(C) Basic Operations Research:** Graphical and simplex method for linear programming; Transportation and assignment models; Elementary queueing theory.

**(D) Basic of Project Management:** Need for management of projects, CPM and PERT methods, Project costing ; Project crashing; Slack and float determination; Resource allocation problem - resource leveling and resource balancing.

##### Paper - II

##### PART 'A'

**(A) Thermodynamics:** Applications of first and second law of thermodynamics; Detailed analysis of thermodynamic cycles.

**(B) Fluid Mechanics:** Reynold's transport theorem and its applications; Ideal fluid flow; Velocity distribution for laminar and turbulent flow in pipes; Dimensionless analysis and similitude; Forces on immersed bodies and boundary layer over a flat plate.

**(C) Heat Transfer:** Conduction in the presence of heat sources and sinks; One-dimensional unsteady conduction; Time constant for thermocouples; Momentum and energy equations for boundary layers on a flat plate; Dimensionless numbers; Free and forced convection; Nature of radiant heat; Basic radiation heat transfer.

**(D) Energy Conversion:** Combustion phenomenon in S.I. and C.I. engines; Carburation and fuel injection; Classification of hydraulic turbines and specific speed; Centrifugal and reciprocating pumps; High pressure boilers.

##### PART 'B'

**(E) Refrigeration and Air-Conditioning:** Vapour compression, vapour absorption and air refrigeration systems; Properties of important refrigerants; Psychrometric properties and relations; Use of psychrometric chart; Estimation of cooling load.

**(F) Quality and Reliability:** Quality needs and parameters; Statistical quality control charts -  $\bar{x}$ ,  $R$ ,  $p$ ,  $\sigma$ ,  $c$  and  $u$  charts, operating characteristics curve; Quality assurance - single and double sampling plans, sampling with rectification, operating characteristic curve, average sample size; Reliability - measurement for parallel and series systems; Life expectancy; Type of maintenance.

**(G) Production Planning and Control:** Types of production systems; Plant and machinery layout considerations and techniques; Aggregate planning; Inventory planning and control models for discrete demand and single-period stochastic demand; service level and safety stock; Materials classification schemes; MRP, MRP-II, CRP; Scheduling and sequencing methods; JIT production system; KANBAN systems; Productivity.

**(H) Engineering and Managerial Economics:** Economic evaluation techniques - present worth, future worth, annuity, IRR, ERR methods; Depreciation techniques; Financial statements - balance sheet, profit and loss account, financial ratios; Financial instruments - shares, debentures, bonds; Financial instruments' evaluation.

#### Chemical Engineering

##### Paper - I

##### PART - A

**1. Material and Energy Balances:** Engineering Dimensions and Units; Gas Laws and Vapor Pressure; Conservation of Mass and Energy; Material Balance with and without



Reactions and Recycle.

**Operations Involving Particulate Solids:** Properties and Handling of Particulate Solids; Size Reduction- Crushing and Grinding and Related Equipment; Particle Classification; Mixing of Solids and Pastes; Sedimentation and Setting; Centrifugal Separators.

**2. Thermodynamics:** Perfect Gas Laws; Real Gases; General Energy Equations; Change of States; Laws of Thermodynamics; Concept of Chemical Equilibrium; Free Energy and its Applications; Fugacity and Activity Coefficients.

**3. Fluid Flow Operations:** Pressure Measuring Devices; Viscosity of Fluids; Equations of Fluid Flow for Compressible and Incompressible Fluids; Laminar and Turbulent Flow in Pipes; Reynolds Number; Pressure Loss; Economic Pipe Selection; Metering of Fluid Flow; Similarity Between Energy, Mass and Momentum Transfer, Non-Newtonian Fluids; **Compressors, Pumps, Fans and Blowers:** Classification; Properties; Characteristic Curves; Parallel and Series Operations; Noise; Agitation and Mixing of Liquids.

**4. Heat Transfer Operations: Conduction:** Basic Concepts; Film Coefficients; Composite Wall; Log Mean Values; Lagging Materials and Critical Insulation Thickness; **Convection:** Forced and Natural Convection; Film Coefficients, Heat Exchangers; Heat Transfer to Fluids with Phase Change; **Radiation:** Laws and Factors Governing Radiative Heat Transfer; Combination of Heat Transfer Modes; Unsteady-state Heat Transfer.

#### PART - B

**1. Mass Transfer Operations:** Diffusion; Convective Mass Transfer; Phase Equilibrium; Mass Transfer with Phase Change; Evaporation and **Drying:** Evaporation Equipment and Operation Methods; Heat Transfer Coefficient in Evaporators; Single, Double and Multiple Effect Evaporators; **Drying:** Water Vapor Pressure and Humidity; Psychrometric Charts; Equilibrium Moisture Content of Materials; Method of Drying; Constant and Falling Rate Drying Curves; Equipment for Drying; **Crystallization:** Solubility Curves; Crystallization; Crystallizers.

**2. Gas-Liquid and Vapor- Liquid Separation Processes:** Types of Separation Processes and Methods; Equilibrium between Phases; Single and Multiple Equilibrium Stages; Mass Transfer between Phases; Humidification; Absorption, Driving Force, Packed Absorption Tower, Bubble Plate Absorption Tower, Absorption Tray Efficiencies; **Vapor-Liquid Separation Processes:** Vapor-Liquid Equilibrium; Constant Boiling Mixture; Distillation Methods; Volatility; Simple Distillation Methods; Distillation with Reflux and McCabe-Thiele Method; Distillation Tray Efficiencies; Azeotropic Mixtures.

**3. Liquid-Liquid and Solid -Liquid Separation Processes:** Single and Multi-stage Stage Liquid-Liquid Extraction Processes; Equipment for Liquid-Liquid Extraction; Filtration; General Relationships Constant pressure and Constant Rate filtration, **Liquid-Solid Leaching:** Basic Concepts and Equipment; Equilibrium Concepts; Single and Multi-stage (Counter-current) Leaching.

**4. Chemical Reactions and Reactors and Process Control:** Zero, First, Second and Non-linear Order Reactions; Half-Life and Doubling Time; Consecutive Reactions; Mixed Batch Reactors; Plug-Flow Reactors; Completely Mixed-Flow Reactors; Mixing Models; Comparison of Reactor Performance; **Process Control and Instrumentation:** First and Second Order Systems; Physical and Block Diagrams; Input, Controlling, and Actuating Means; Final Control Elements; Input Functions and Their Type; Oscillatory Element; Control and Measurement of Concentration, Flow, Level, Pressure, Temperature Control Systems; Mechanical Dampers; Distillation Column Control; Computer Aided Process Control.

#### Chemical Engineering

##### Paper - II

#### PART - A

**1. Process Equipment and Plant Design:** Cylindrical and Spherical Vessels; Theories of Failures; Types of Formed Heads; Crown and Knuckle Radius; Static and Dynamic Stresses; Longitudinal and Circumferential Stresses; Joint Efficiency.

**2. Materials of Construction:** Corrosion and Application of Corrosion Resistant Materials; Polyethylene, Poly propylene, Poly Vinyl Chloride; Rubber; Teflon; Glass; Cast Iron; Lead; Stainless Steel; Monel; Hestelloy; Nickle Alloys; Titanium Alloys; Insulating Materials.

**3. Energy Resources and Conservation:** Renewable and Non-renewable Energy Resources; Solar Energy; Fossil Fuels- Classification and Composition; Physico-chemical Characteristics and Energy Content of Coal, Petroleum, and Natural Gas; Wind Energy; Biomass and Biogas; Energy Use Pattern and Future Energy Needs; Energy Conservation Policies; **Combustion:** Ultimate Analysis of Coal; Proximate Analysis of Coal; Analysis of Fuel Gas; Heating Value of Fuels; Combustion Chemistry and Equations; Combustion of Solid, Liquid and Gaseous Fuels; Air for Combustion.

**4. Inorganic Industries: Steam and Water:** Water Treatment; Distribution of Water; Saturated and Superheated Steam; **Inorganic Industries:** Acids; Hydrochloric, Hydrofluoric, Hydrobromic, Sulfuric, Nitric Acids; Cement and Lime; Chloralkali; Nuclear; Explosives and Propellants; Fertilizers.

#### Part-B

**1. Organic Industries:** Petroleum Refining; Petrochemicals- Methane, Ethylene, Acetylene, Propylene, Butene; Polymerization Techniques; Chemicals from Aromatics; Herbicides Pesticides and Insecticides; Paint and Varnish; Oils, Soap and Detergents; **Fermentation Industries and Herbal Products:** Production of Alcohols; Mint and Essential Oils; Flavour and Fragrance.

**2. Industrial Pollution Control- Wastewater Treatment:** Sources, Type and Effects of Pollutants; Collection and Transport, Preliminary and Primary Treatment, Secondary Treatment, Tertiary Treatment, Sludge Treatment and Disposal, Selection of Treatment Strategies; Design of ETP for Industrial Wastewater Effluent from Paper, Tannery, Sugar, Distillery, Dyeing, Fertilizer, Pharmaceutical and Pesticide Industries.

**3. Industrial Pollution Control-Air Pollution, Solid Wastes and Noise Pollution:** Major Air Pollutants, Sources and Effects of Air Pollutants, Air Quality Standards; Air Quality Control- Treatment of Gaseous and Particulate Emissions, Dispersion of Pollutants; **Solid Waste:** Generation, Collection and Characterization of Solid Wastes; Reuse, Recycling and Combustion of Solid Wastes, Hazardous Wastes and their Management; **Noise Pollution:** Measurement of Noise; Effect on Human Health and Work Efficiency; Noise Abatement and Control.

**4. Hazard and Risk Analysis and Safe Working Practices and Personnel Protection:** Hazard Analysis; Risk Assessment and Management; Hazard and Operability Studies; **Fire and Fire Hazard:** Fire Prevention and Fire Fighting in Chemical Plants; **Safe Working Practices and Personnel Protection:** Handling, Storage and Transportation of Materials; Intrinsic and Extrinsic Safety; Safe Working Practices; Importance of Good House-keeping; Work-Place Safety; Personnel Protection Equipment; **Engineering Decisions:** Decisions Based on Technical, Cost/Effectiveness, Cost/Benefit, Risk, Environmental and Ethical Decisions.

#### Fire Engineering

##### Paper - I

**1- BASICS OF CIVIL ENGINEERING-** Introduction to Civil Engineering, General concepts related to building, Components of Buildings, Building Materials, Surveying, Instrumentation in Civil

Engineering Structures, Water Resources Engineering-Introduction to Hydraulic structures of storage; water conveyance systems; Watershed management: Definition, Necessity and methods; Transportation Engineering-Role of transportation in national development; Various modes of Transportation. Classification of Highways: Expressways, NH, SH, MDR, ODR, VR; Types of Pavements, Traffic Signs, signals, Parking system, and Causes of Accidents.

**2- BUILDING PLANNING AND CONSTRUCTION-I-** Behaviour of building materials and elements of structure under fire and fire fighting conditions, fire hazard, personnel hazard, damage hazard, fire precautions, fire precautions in relation to fire hazard, Grading of Occupancies to damage hazard with reference to fire load and fire resistance of elements of structure. Problems of High rise buildings and their safety measures. Behaviour of retardant structures under fire, Stairs, Sizes, layout and various kinds of stairs in different kinds of buildings.

**3- BUILDING PLANNING AND CONSTRUCTION-II-** Grouping of buildings on the basis of- Population, characteristics and occupancy, Precautions relating to personal safety in various occupancies; their constructional features, exists, staircase, their location and travel distance, maintenance and calculation of discharge value etc.

(i) Roof Exists:

(ii) Portable Means of Escape and their Maintenance.

2) Layout Plans, Scale Plan, Elevations and Sections, Sketch of a Fire. Activity. Sketch of Zone, Surrounding, Fire Incident at a Place.

3) Maps and Layouts, Survey, map, Schematic diagram, Contour map and Isometric projection.

4) Fundamentals of Fire Safe Building design; Systems concepts of Fire Safe Building design: Building and site planning for fire safety;

**3- FLUID MECHANICS -** Flow Through Pipes & Fire Fighting Hoses: Equations for pipe flow. Friction charts and their uses, Losses in pipes and fittings, Hydraulic gradient lines and total energy lines, Pipes in series and parallel. Siphon, Water hammer phenomenon. Economic of pipe systems. Power Transmission Through Pipeline: Condition for maximum power transmission through a given pipeline (single pipe), Relationship of nozzle diameter to pipe diameter for maximum power transmission.

**4- AUTOMOBILE ENGINEERING-** Classification, construction details of Engine Component Combustion in S.I. Engines. Combustion in C.I. Engines. Type of Study of diesel petrol gas fuel feed systems Transmission assembly. Types of Gear box, Transfer of gear box operation and maintenance of gear box. Propeller shaft. Axles, Types and Application Brakes type construction and Operation of Hydraulic Pneumatic Brake systems. Maintenance of brakes. Types classification of system Lubricants Cooling System- Air Cooling Water Cooling components and working of cooling system Ignition System Magnet Ignition Battery Ignition Electronic Ignition Merits and Demerits, Working. Self Starter, Dynamo voltage regulator, Battery construction, operation and maintenance. Construction, operation and Maintenance of fire fighting. vehicles and appliances.

Construction and operation of fire boats and other rescue and extinguishing appliances, Study of different types of chassis and superstructure, Rules and Regulations of R.T.O.

**5- APPLIED ELECTRICAL ENGINEERING-** Introduction to Power Generation (Thermal, Hydro, Nuclear, Wind, and Solar). Generation, Transmission & Distribution through different voltage levels; Low voltage distribution system (Over head & Underground, single phase & three phase), Definitions of luminous flux, luminous intensity, candle power, illumination, luminance, luminous efficiency (lumens/watt) of different types of lamps, AC motor, Three-phase Induction Motor Single Phase Induction Motors, Necessity of equipment earthings, Fuses (Rewirable & HRC), MCB, ELCB (Elementary concepts only), Basic operation of UPS & Invertors.

**6- ELEMENTS OF ELECTRONICS & COMMUNICATION:** Modulation: AM, FM and Phase, modulation principles and basic circuits, HFV & VHF transmitters, Demodulation of AM and FM. AM Receivers, Crystal, Tuned Radio Frequency (TRF) and super heterodyne receivers, Block diagrams and Principles. Ground Wave, Ionosphere, Duet Propagation, Antenna: Principles of Dipole antenna, Yago array, Directive and broad band Antennas, TV: Basic Principles of T.V. transmitters and receivers, Radio links, Principles of microwave links and satellite communication.

**7- APPLIED PSYCHOLOGY- Psychology of learning:** Fire-fighting skills as learned behavior, Principles of learning useful in the training of fire-fighting personnel, learning values and attitudes required in a successful fire-fighter; Fire-fighting as risk-taking behavior, Calculated-as-irratic risk-taking' Need for assessing risk-taking tendency in fire-personnel. Fire-site as a social situation victims, Spectators and fire personnel as its constituents, Human factors in occurrence of fire e.g. age, sex, education, social status and in mode of escape; General characteristics of, behaviour under panic; Characteristics of crowd behavior, General considerations in handling the spectators and the victims, without lowering efficiency. Fire-fighting as interactional situation; Importance of effective communication among the interacting elements; Fire-fighting as a team-work, significance of communication in the team members.

**8- PARAMEDICS -** Paramedics: definition; qualities of duties, tasks of a paramedics. Study of the human body and its various systems such as the system armascular systems, digestive system, respiratory system, circulatory system central nervous system, excretory system

**9- FIRE CODES & STANDARDS-** Specification of Rescue of fire fighting equipment. Technical parameter / specification specific reference to appliances. Code & Standards concerning construction & Design of building. Code and Practice for construction of temporary structures, pandal, Samiyana and scaffolding. International code & standard for Hydraulic platform. Turntable ladder and other Rescue and fire fighting devices and components. Code and Standard for passive fire protection system and materials. Code, Standard and specification concerning to safety of fire fighting personnel i.e., Breathing Apparatus P.P.E., safety gears and other devices. Code, Standard and byelaws concerning Industrial, Municipal and State life safety & fire protection measures.

**10- FIRE SERVICE HYDRAULICS-** Basic Principles of Hydraulics — Properties of water. water Pressure at a point, Measurements of pressure, hydrostatic forces - Total pressure and centre of pressure, - Bernoulli's Theorem and Applications, Hazen-Williams Formula, Pressure Loss in pipes and Fittings, Flow through nozzles, power transmitted through nozzle, condition for maximum transmission, nozzle reaction, water hammer, Introduction, main parts of centrifugal pumps, work done by centrifugal pumps on water, cavitation, Introduction, main parts of a reciprocating pump, working of a reciprocating pump, multistage centrifugal pumps, effect of velocity on friction in suction and delivery pipe, Automatic Sprinkler system- types of sprinkler system, sprinkler system in tall building, wall wetting sprinkler, design of sprinkler system, Reliability of sprinkler system, water spray and deluge system.

**11- ARTIFICIAL INTELLIGENCE-** What is AI?. The Foundations of Artificial Intelligence, Robotics — Tasks', application, Parts, Architectures, Configuration Spaces, Navigation and Motion Planning, Fundamentals of Robotics/Fundamentals of Robot Technology, Programming and Applications Robot Technology: The Robot and its Peripherals: Control Systems and Components, Robotics Technology of the Future and Future Applications: Robot Intelligence, Advanced Sensor Capabilities, Tele-presence and Related Technologies, Mechanical Design Features, Mobility, Locomotion and Navigation. The Universal Hand. Systems Integration and Networking, Characteristics of Future Robot Tasks. Future Manufacturing Applications of Robots. Hazardous and Inaccessible Non- Manufacturing Environments, Service Industry and Similar Applications, Summary, Foundation of Reasoning & Perception, on the Possibility of Achieving Intelligent Behaviour intentionality and Consciousness

**12- URBAN PLANNING-** Urban Growth and System of Cities. City — Region Linkages: City; fringe and the periphery, Metro and Mega Cities: Problems and Issues, Growth trends and processes, characteristics; problems, concepts and concerns of urban sustainability, Human Settlement Planning and Urban Development Concepts, Planning for under-ground development like metro rail, tunnels, market complexes and any other modern development. Water Supply and Sanitation: Quantity & quality, source of supply, transmission and distribution, treatment methods., design guidelines. Sanitation --- concept disposal systems, low cost sanitation options, engineering aspects of sewage disposal. Fire and Electrification: Planning for fire protection, services and space standards, location criteria Traffic and Transportation: Planning for infrastructure and facilities for transport.

#### Fire Engineering

##### Paper - II

**1- FIRE RETARDANTS -** Basic concepts of fire retardants, definition and terminologies, classification of fire retardants, flame spread, flame retardant. Difference between flame and fire retardant, Mechanism and principles of operation of fire retardant, Physical action, Mechanism and principles of operation of flame retardant, Fire retarding materials, Textile, composites, natural polymers, lignocellulosic materials & intumescent material. Application of halogen flame retardants, Graft Copolymerization as a tool for flame retardancy, performance based test methods for material flammability.

**2- SPECIAL HAZARDS & FIRE PROTECTION-I-** Constructional features of an Air Crafts and Helicopters, Basic Fire-Hazards, Nature of Air Crashes, Emergency landings including belly leading etc, Problems of rescue and fire-fighting in Aircraft & helicopter carrying ammunition, bombs, nuclear weapons etc, Crash Tender: Provision of Crash — Fire — tenders including Rapid Intervening appliances; Categorization of Air-Port, their extinguishing media. Constructional features of



Passenger and cargo ship, shipyard and port. Hazards, preventive measures and tactical management. Constructional features of Passenger and goods train, yard, tunnels and railway station. Hazards, preventive measures and tactical management, Study of Layout and plan of Nuclear establishment, Hazards, preventive measures and tactical management.

**3- FIRE MODELING-** Modeling: Models and reality, properties of model, building a model, need of model. Linear programming and model formulation: structure of linear programming model, application of LP model, general mathematical model for linear programming problem, solution of LP model (Graphical and Simplex method), sensitivity analysis, Network Model — Project Management, Formation of Network, CPM & PERT analysis, Probability of Completion of Project, Cost Analysis of Project, and Concept of Crashing.

**Fire modeling:** Elements of fire, fire propagation, fire compartment, the fire flame and plumes, the hot and cold gas layers, burning regime estimate

**4- FIRE CODES & STANDARDS:** Specification of Rescue of fire fighting equipment. Technical parameter / specification specific reference to appliances. Code & Standards concerning construction & Design of building. Code and Practice for construction of temporary structures, pandal, Samiyana and scaffolding. International code & standard for Hydraulic platform, Turntable ladder and other Rescue and fire fighting devices and components. Code and Standard for passive fire protection system and materials. Code, Standard and specification concerning to safety of fire fighting personnel i.e., Breathing Apparatus P.P.E., safety gears and other devices. Code, Standard and byelaws concerning Industrial, Municipal and State life safety & fire protection measures, BIS codes as mentioned in national building code of India-2016 part 4, OISD guidelines for oil and gas installations.

**5- FIRE SERVICE HYDRAULICS-** Basic Principles of Hydraulics — Properties of water, water Pressure at a point, Measurements of pressure, hydrostatic forces - Total pressure and centre of pressure. - Bernoulli's Theorem and Applications. Hazen-Williams Formula, Pressure Loss in pipes and Fittings, Flow through nozzles. power transmitted through nozzle, condition for maximum transmission), nozzle reaction water hammer Introduction. main parts of centrifugal pumps work done by centrifugal pumps on water, cavitation, Introduction, main parts of a reciprocating pump, working of a reciprocating pump, multistage centrifugal pumps, effect of velocity, on friction in suction and delivery pipe, Automatic Sprinkler system- types of sprinkler system, sprinkler system in tall building, wall wetting sprinkler, design of sprinkler system, Reliability of sprinkler system, water spray and deluge system.

**6- FIRE PROTECTION: Fire Resistant Construction, Construction materials** — Steel, Steel Insulation, Concrete, Fire resistance calculations .Fire resistance tests — **Furnace exposure tests, Empirical correlations, High intensity fire resistance tests.** Fire Walls — General criteria for fire walls, Fire wall design, Fire wall loss experience. **Fire doors** — Types of fire doors, Fusible links and detectors, Reliability issues. **Insulated metal deck roofing** — Description, Tests and classifications, Water spray protection of exposed structures, Smoke Production & Properties, Particle size of **smoke** from burning wood and plastics, Smoke Aerosol Properties, Visibility, Smoke isolation and venting, Isolation and suppression within ventilated equipment. **Building smoke control** — Buoyancy pressure differences, Volumetric expansion pressures, Isolation via ventilation exhaust, Upstream smoke propagation, Door and damper smoke leakage, Heat and smoke roof venting.

**7- SPECIAL HAZARDS & FIRE PROTECTION-II-** Flammable liquid ignitability and extinguish ability, Flash points and fire points, Auto ignition temperatures, High flash point, liquids, Water miscible liquids, Low flashpoint liquids Low Expansion Foam, Medium, and high expansion foam Dry Chemical and twin agent. extinguishment Carbon dioxide suppression,; Halon replacement suppression agents, **Flammable liquid storage: Storage Tanks** — Generic tank designs, Storage tank loss history and fire scenarios, Fire protection of oil Tank Farm area, Electrical cables and equipment, Electrical cables: Generic description, Cable fire incidents' Cable flammability testing and classifications, **Cable fire suppression tests** — Sprinkler and water spray suppression tests, Gaseous suppression system tests, Electronic component flammability, Detection and suppression of electronic equipment fires-, Transformer generic description, Transformer fire scenarios, Transformer fire incidents, Installation and fire protection guidelines **Blast Waves:** ideal blast waves, Pressure vessel ruptures, Vapour cloud explosions, Vented gas and dust explosions.

**8- FIRE & SMOKE DYNAMICS:** Fuels and the combustion process, The physical chemistry of combustion in fire, Burning of liquids and burning of solids.

Ignition of flammable vapour/air mixtures, Ignition of liquids, The phenomenology of flame spread, Theoretical models of flame spread, Spread of flame through open fuel beds, Applications, Spontaneous ignition in bulk solids, Smouldering combustion, Glowing combustion, The, growth period and the definition of flashover, Growth to flashover, Fire resistance and -fire severity, Methods of calculating fire resistance, Projection of flames from burning compartments, Spread of fire from a compartment, Production and measurement of smoke, Smoke movement, Smoke control systems.

**9- PASSIVE FIRE SAFETY MEASURES:** Terminology used in Buildings and different occupancies. Occupancies, General requirement in the building. Types of construction, Fire resistance ratings of materials. Affecting factors of Means Of Escape and Structural Fire Safety, Compartmentation, Fire separation wall, Smoke Extraction systems Analytical method of fire resistance of steel members concrete members, Timber member and other affecting component/parts of buildings.

**10- FIRE LAWS:** The Law and the Fire Service, The Law suit process, Judicial System, Legislatures and Statue, Doctrine of Sovereign immunity; Governmental liability in India with reference to the Indian Constitution, Code and code enforcement, Standards and the Law, Model Fire Service Legislation, its scope and object, The Petroleum Act of 1934, Calcium Carbide Rules, Cinematograph Act, 1938, Factories Act of 1938, Explosives Rules of 1940, Fire Safety Act, Factories Act and Civil Right Act. General Principles of Compensation Laws and Fire Insurance Assessment and Case studies, Occupational Safety and Health Act (OSHA), Disaster Management Act -2005, Uttar Pradesh Fire prevention and Fire Safety act-2005 and rules, National building Code -2016.

**11- DESIGN & INSTALLATION OF DETECTION AND FIRE FIGHTING SYSTEM:** Provisions & applicable standards of detection and alarm system, Introduction of detection devices, alarm and detection system, Type of detectors, Method of selection, design, installation, testing and commissioning of alarm and detection system, Hydraulic Calculation, Design of hydrants, wet riser and dry riser system, Design of Sprinkler system: types of Sprinkler Systems, Calculation of Spray systems based on hazards, Design, Calculation and installation of fire pumping system based on standard norms and procedure, Installation, Testing and Commissioning of water based fixed fire fighting system. Classification and property of foam, gases and dry chemical powder. Provisions & applicable standards of foam, gases and dry chemical powder based systems, Identification, Hydraulic Calculation and Design of foam system, foam application method, Description, number and placement of foam application devices, Selection of foam agent, Rate of application of foam solution, Rate of foam concentrate, Identification and Design of clean agent based system. Design of Fire Alarm System, purpose, general requirements, operation, types of fire alarm system and their maintenance.

**12- FIRE & ARSON INVESTIGATION:** The nature and behaviour of fire: Elements of Combustion, Flaming and Glowing Fire, Explosive Combustion, Heat Transfer, Sequence of Room Fire, Effects of Environmental Conditions, Combustion Properties of Liquid & Gaseous Fuels. Combustion Properties of Solid Fuels, Source of Ignition: Primary Igniter, the role of services and appliances in starting fire, Structure fire & their investigation: Elements of building construction, General principals of fire behaviour, Investigative information during suppression, Examination of structure fire scene, Documenting the fire scene, Grass and Wild Fires, Automobile Motor Vehicle and Ship Fires, Electrical causes of Fire, Clothing & Fabric Fire, Explosion & Explosive Combustion, General Fire Evidence, Identification of Charred or Burned Materials & Documents, Failure Analysis-Forensic Engineers, Evaluation of Appliances & Wiring, Miscellaneous Laboratory Test, Chemical Incendiaries Non-Fire-Related Criminal Evidence: Fingerprints, Blood, Impression Evidence, Trace Evidence.

#### Hydraulics Engineering Paper-I

##### Fluid Mechanics

Flow characteristics, Classification, Fluid properties, Fluid pressure and its measurement, Continuity equation, rotational and irrotational flow, vorticity, velocity potential and stream function, flow net, Euler's equation, Bernoulli's equation and its applications, Darcy-Weisbach equation, energy losses in pipelines, equivalent pipes, multiple pipe systems, siphon. Laminar and Turbulent flows, Laminar flow in parallel plates, pipes, characteristics of turbulent flow, Concepts of boundary layer, Dimensional homogeneity, Buckingham's  $\pi$  theorem, geometric, Kinematic and dynamic similarity, model studies, Types of open channels, classification of flows, concept of specific energy, critical depth, Chezy's and Mannings equation, roughness coefficients, equivalent roughness, Hydraulically efficient channel cross sections.

Equation of fluid flow - Conservation of mass, conservation of momentum, stress and strain in fluid flow and their relations, conservation of energy, work done due to viscous stress, Navier stokes equations, Three dimensional Continuity equation in Cartesian, Laminar flow of viscous incompressible fluids, Flow between parallel flat plates, Couette flow, plane Poiseuille flow, flow in cylinders, in rotating cylinders, flat plates; Boundary layer equation, Blasius solution, shear stress and boundary layer thickness, boundary layer on a surface with pressure gradient, momentum integral

theorem for boundary layer, separation and its prevention by boundary layer suction; Concept of linearized stability of parallel viscous flow, transition to turbulent flow, Reynolds equation for turbulent flow, Reynolds stresses, Prandtl's mixing length theory, velocity profile, turbulent flow in pipes, turbulent boundary layer on flat plate; Inviscid flow, Elementary plane flow solutions, uniform stream, source or sink, vortex. Superposition of plane flow solutions, flow over wedge and circular cylinder.

##### Hydrology

Introduction to Hydrology, study and analysis of the basic processes of hydrology of watershed including the theory, measurement and application of mathematical, statistical and graphical techniques associated with each of phenomena; Run off hydrographs and unit Hydrographs for complex storms; synthetic and instantaneous hydrographs; Flood estimation and routing -Modern techniques; prediction of peak flow and snowmelt; yields from basins; Introduction to Hydrometeorology: Agro-climate; Climatic parameters; Instrumentation; Data recording and Trend analysis.

##### Hydraulics

Introduction to flow in open channels, Uniform flow and critical flow, Gradually varied flow — Theory and flow computations with special reference to compound sections, Flow profiles; Rapidly varied flow — Energy-depth relationships, Hydraulic Jump — prismatic and non-prismatic channel, Hydraulic jump as energy dissipators, Crested weirs, ogee spillway; Culvert hydraulics; Sluice gate flow; Spatially varied flow with increasing and decreasing discharge, Side weirs, Bottom racks; Channel design, Silt theories — Kennedy's and Lacey's, Erodeable and non-erodeable channels; Introduction to River Hydraulics, Sediment transport, River mechanics, river erosion, river training works, Dams — purpose, classification and site identification; Hydraulic models — Concept, Classification, Applications, & Modelling.

Fluid properties, Forces on submerged objects, Similitude and dimensional analysis, the energy equation for an ideal fluid. Introduction to flow in open channels- Velocity profiles, the energy equation applied to real fluids, Flow resistance, Computations for steady, uniform flow. Flow in channel sections with variable roughness, the momentum principle, Specific energy. Gradually varied flow in open channels, Determination of flow resistance in open channels, Classification of water-surface profiles, Local energy losses in natural channels, Water-surface profile computations. Discharge computations for rapidly varied flow, Rapidly varied flow at constrictions, Flow through culverts, Flow over weirs.

##### Groundwater Hydrology

Introduction to groundwater resources, occurrence and movement, Aquifers and their characteristics/classification, - Surface investigation - Geophysical -electrical resistivity - Seismic refraction - Gravity and magnetic - Geologic - Air photo interpretation - Dowsing. Subsurface investigation - test drilling -resistivity logging- potential logging - temperature and caliper logging, Darcy's law, Dupit's assumptions; Flow nets, Groundwater tracers, Well hydraulics —steady/unsteady, uniform/radial flow to a well in a confined/unconfined/leaky aquifer, Well flow near aquifer boundaries/for special conditions; Groundwater levels, Quality of groundwater, Contaminant transport processes, Advection-dispersion equation, Treatment of contaminated groundwater, Climate change and groundwater; Introduction to Groundwater flow modelling, Governing equations, Finite difference solutions, Surface and sub-surface investigations, Artificial recharge, Saline water intrusion in aquifers

##### Hydro Power Engineering

Planning of Hydropower development; Hydropower potential; Operation of power plants for peak and base load; Characteristics of power market; Integration of various types of plants; Augmentation of power plants; Different types of hydro power plants; Small hydro power plants; Flow duration curve and its characteristics; Classification of modern turbines, efficiency, speed regulation, governors, coupling of turbines and generators. Types of power houses; Silting of reservoir, dead storage and useful life, rate of sedimentation, distribution of reservoir deposits, silt control. Surge tanks and hydraulic transients; Penstocks and pressure shafts; Intakes; Reservoir operation for hydropower generation in multipurpose projects; Basin scale hydropower development; Mathematical models for reservoir sizing and operation.

##### Hydraulic Machinery

Principles of impingement of jets - Impact of jet on a stationary vertical plate, stationary inclined plate, stationary curved plate, hinged plate, moving vertical and inclined plates, moving curved plate and on series of moving flat and curved vanes fixed on the periphery of circular rim. Turbines - classification-impulse turbines - Pelton wheel - Reaction turbines - Francis and Kaplan Turbines - draft tubes - Governing of a Francis turbine - Performance of turbines - specific speed and their significance. Centrifugal pump - description and working - Head, discharge and efficiency of a centrifugal pump - pressure rise in the pump - minimum starting speed of a pump - cavitation - priming -multistage pumps - characteristic curves. Reciprocating pump - Description and working - types - discharge and slip - power required to drive the pump -Indicator diagram - Air vessel - work done against friction with and without air vessels. Working principle and use of the following hydraulic pumps and machines - Deep well pumps - submersible and jet pumps, special pumps - Gear pump - screw pump, sewage pump, miscellaneous machines - Hydraulic press - hydraulic accumulator - Hydraulic ram.

#### Hydraulics Engineering Paper-II

##### Water Resources Engineering

Hydrologic cycle - rainfall, and its measurement - computation of mean rainfall over a catchment area using arithmetic mean, Thiessen polygon and Isohyetal methods - Runoff -infiltration indices - Storm Hydrograph and unit hydrograph River regions and their characteristics - classification of rivers on alluvial plains - meandering of rivers - river training Reservoir planning - Investigations -zones of storage in a reservoir - single purpose and multipurpose reservoir -determination of storage capacity and yield - reservoir sedimentation -Reservoir life - Sediment prevention - Flood estimation- Flood forecasting -Flood routing.

**Ground water** - types of aquifers - storage coefficient - coefficient of transmissibility - steady radial flow into a well located in an unconfined and confined aquifers - Tube wells and Open wells - yield from an open well. Water logging - causes and effects of water logging - remedial measures - land reclamation - land drainage - benefits - classification of drains - surface drains -subsurface drains - design principles and maintenance of drainage systems.

##### Water Resources Planning & Management

Historical profile on world water resources development; Global water resources, Hydrologic cycle, Watershed zoning, Interrelation of water resources with other natural resources and the environment, Water quantity and water budget, Water allocation and water scheduling; Watershed management, Rainfall-Runoff analysis, Floods measurement, frequency analysis, design of peak flood and routing, Reservoir operation and design; Water resources availability and demand, Water use sectors — Domestic, Industries and Agriculture, Sustainable water resources development, Integrated Water Resources Management (IWRM), Socio-economic aspects of water resources management, Rainwater Harvesting; Water resource planning — concept, preliminary study, feasibility study, detailed planning, Design of water distribution system, Irrigation scheduling and techniques; Hydrologic Processes precipitation, evaporation and transpiration. Water quality parameters. Water pollution — causes, effects and measures., Global Efforts on Water conservation. Think Globally Act Locally on water resources, Local water organizations. National Water Policy, World water, organizations. Environmental Considerations on dam Construction.

##### Irrigation And Hydraulic Structures Irrigation - necessity –

Types of irrigation - Methods of supplying water -Assessment of irrigation water - Consumptive use and its determination - water requirement of various crops - Duty - Delta - Base period and crop period. Functions and components of a diversion head work - Function - selection of site - type of weirs on pervious foundations - cause of failure - Bligh's creep theory and. Khosla's theory -complete design of a vertical drop weir. Gravity dams - Non overflow section - forces acting - stability rules - elementary profile - Low and High dams - drainage gallery - Construction joints - Earthen dams -stability of slopes by slip circle method - seepage analysis and its control Types of canals - canal alignment - Kennedy's silt theory - Lacey's silt theory - Design of canals using the above theories - economical depth of cutting - canal losses - canal maintenance - lined canals, and their design - silt control measures. Canal falls - Necessity and location - Design of sand type fall - design of a cross regulator - cross drainage works - selection of suitable type of cross drainage work - canal outlets

##### River Mechanics and Sediment Transport

Introduction to river mechanics, Width-to-depth ratio of a river, Two-phase motion and its dimensionless variables, Mechanical properties of flow, Aggrading rivers, Degrading rivers, Meandering rivers, Bed Forms; Regime Channels, Channel roughness and resistance to flow, Tractive force method of stable channel design, Erosion, deposition, scour; Local scour problems; Introduction to sediment transport, Threshold of particle transport - critical velocity and critical shear stress concepts, Sediment movement in water, Principles of transport of solids in pipes, Principles of movement of sediment by waves tides and currents; Sediment Load, Bed load estimation - du Boys, Shields, Meyer Peter, Einstein bed load function, Yalin's formula, Paintal stochastic approach, Suspended load - diffusion theory, Total sediment load by Kalinake, Latest models in sediment load assessment.



**Watershed Management**

Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management. Characteristics of Watershed - size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds. Principles of erosion, Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. Measures to Control Erosion, Contour techniques, ploughing, furrowing, trenching, building, terracing, gully control. rockfill dams, brushwood dam. Gabion. Rainwater Harvesting, catchment Harvesting, Harvesting structures, soil moisture conservation. Check dams artificial recharge, farm ponds, percolation tanks. Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils. Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation. Planning of watershed management activities, peoples participation, preparation of action plan, administrative requirements.

**Water Harvesting Techniques:**

Design of small water harvesting structures- Types of storage structures- Yield from a catchment- Losses of stored water. Water conservation practices-manuals and guidelines.

**Environmental Hydrology**

Basic concepts of environmental hydrology; water cycle, water balance and hydrological processes; environment and water; hydrology and climate, physical and biological interactions; water-related environmental problems; hydrological characteristics of India; drinking water, drinking water regulation and standards, water testing; forest hydrology, hydrological processes in forested area; urban hydrology, urbanization and hydrological processes, runoff process and flood; storm water storage and infiltration, reconstruction of urban water cycle; domestic, industrial, commercial, agriculture, and public water uses; water rights and development; water pollution and water quality policy, point and non-point source pollution and control, self-purification; groundwater pollution, background and measurements of groundwater contamination, sources and fate of contaminants, organic solvents, phosphate and nitrate, remediation.

**Fluvial Hydraulics;**

River morphology- and its characteristics. - Channel configurations such as straight channel, meandering channel, braided channel- Transitions- Cutoffs-Deltas. River behaviour Channel geometry- equilibrium, aggradations and degradation- Effects of long contraction- Effects of over bank flow- Super critical flow in rivers.

Stream profiles and bed material- erosions- Importance of bank erodability. Stabilization and rectification of rivers: Alignment- Radius of curvature-Revetments- Hydraulic models for river engineering.

Stable channels carrying sediment laden water in Alluvial Materials- Blench's Design Methods Tractive Force Method of Design- Application of optimization principles to channel design.

Sediment Engineering: Origin and formation of sediments- Fundamental properties of individual sediment particle- Bulk properties of sediments. Regimes of flow: Description of regimes of flow, origin and characteristics, importance.

River classifications and its hydraulic geometry, geomorphic analysis; Fundamentals of alluvial channel flows, uniform and unsteady cases, shear stress distribution, flow resistance in rivers; properties of sediments, sediment movement in rivers, shear stress, Shields diagram, scouring around bridge piers and embankments, river bed forms; Analysis of river meanders, design of stable alluvial channels-regime concept, dimensional model studies for rivers, braided rivers, scaling and hierarchy in braided rivers, alternate bars, bed load transport in braided gravel-bed rivers; Stream bank erosion, bank protection, flow control structures, bank protection and river training along braided rivers.

**Electronics Engineering**

**Paper-I**

**Basics of Semiconductors:** Energy bands in intrinsic and extrinsic semiconductors, band-gap semiconductors, P-N junction, Zener diode, Diode circuits for different uses; clipping, clamping and rectifiers. Small signal equivalent circuits of diodes,

**Junction & Field Effect Transistors (BJTs, JFETs, MOSFETs):** Transistor characteristics and biasing, Transistor amplifiers of different types; BJTs and FETs; Biasing & stability of BJT & JFET amplifier circuits; Analysis/design of amplifier- single/multi-stage.

**Basics of Integrated Circuits (ICs):** Bipolar, MOS and CMOS ICs; Basics of linear ICs, operational amplifiers and their applications-linear/non-linear; Optical sources/detectors; Basics of Opto electronics and its applications.

**Operational amplifiers:** Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators. Function generators, wave-shaping circuits and 555 timers; Voltage reference circuits; Power supplies: ripple removal and regulation.

**Network Theory and Basic Machines:**

DC circuits-Ohm's & Kirchoffs laws, mesh and nodal analysis, circuit theorems; Single-phase AC circuits; Network graphs & matrices; Wye-Delta transformation; Linear constant coefficient differential equations-time domain analysis of RLC circuits; Solution of network equations using Laplace transforms- frequency domain analysis of RLC circuits; 2-port network parameters-driving point & transfer functions: State equations for networks; Steady state sinusoidal analysis.

Basics-DC machines, induction machines, and synchronous machines. Transformers and its efficiency.

**Digital Electronics:**

Number representations: binary, integer and floating-point- numbers.

Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates, arithmetic circuits, code converters, multiplexers, decoders. Sequential circuits: latches and flip-flops, counters. shift-registers. Data converters; sample and hold circuits, ADCs and DACs.. Basics of multiplexers. counters/registers/ memories /microprocessors, design& applications.

**Control Systems:** Basic control system components; Feedback principle; Transfer function; Block diagram representation, Transforms& their applications; Signal flow graph; Frequency response; Routh-Hurwitz criteria, root loci, Nyquist/Bode plots; Feedback systems-open &close loop types, stability analysis, steady state. transient and frequency response analysis; compensation; Lag, lead and lag-lead . State variable model and solution of state equations of LTI systems. Transient and steady-state analysis of LTI systems.

**Analog communication Systems:** AM, FM, transmitters/receivers, amplitude modulation and demodulation, angle modulation and demodulation. Spectra of AM- and FM, superheterodyne receivers.

**Digital communication basics;** Sampling. quantizing. Cooling PCM. DPCM, multiplexing-audio/video; Digital modulation: ASK, FSK, PSK: Multiple access: TDMA, FDMA, CDMA:

**Instrumentation:** Principles of measurement. Accuracy, precision and standards; Analog and Digital systems for measurement. Measuring instruments for different applications. Static/dynamic characteristics of measurement system, errors, Statisticals analysis and curve fitting.

**Electronics Engineering**

**Paper-II**

**Electromagnetics:**

Elements of vector calculus, Maxwell's equations-basic concepts- differential and integral forms and their interpretation; Gauss', Stokes' theorems; Poynting vector: Wave propagation through different media; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart. Waveguides-basics, rectangular types, modes, cut-off frequency, dispersion, dielectric types; Antennas-antenna types, radiation pattern, gain and directivity, return loss, monopoles/dipoles, gain, antenna arrays.

**Computer Organization and Architecture:**

Basic architecture, CPU, I/O organization, memory organisation. peripheral devices, trends; Hardware/software issues; Data representation& Programming: Operating systems-basics, processes, characteristics, applications. Microprocessors & microcontrollers basics, interrupts, DMA, instruction sets, interfacing: Controllers & uses: Embedded systems.

**Advanced Electronics:**

VLSI technology: Processing, lithography, interconnects, packaging, testing; VLSI design: Principles, MUX/ROM/PLA-based design, Moore & Mealy circuit design; Pipeline concepts & functions; Design for testability, examples.

**Digital Signal Processing:** Discrete time signals/systems. uses; Digital filters: FIR/IIR types, design, speech/audio/radar signal processing uses;

**Communication networks:** Principles/practices/technologies/uses/OSI model/security; Basic packet multiplexed streams/ scheduling; Cellular networks, types, analysis. protocols (TCP/TCP/IP).

**Random signals and processes:** autocorrelation and power spectral density, properties of white noise, filtering of random signals. **Information theory:** entropy, mutual information and channel capacity theorem, Huffman coding, algebraic and convolutional coding.

**Microwave & satellite communication:** Terrestrial/space type LOS systems. block schematics link calculations, system design; Communication satellites. orbits, characteristics, systems, uses; Fibre-optics-Light propagation in optical fibre, fibre optic communication: fibre optics, theory, practice/ standards, systems, block schematics, link calculations, system design.