



# उत्तर प्रदेश लोक सेवा आयोग

विज्ञापन संख्या  
ए-11/ई-1/2025  
दिनांक: 02.12.2025

## उ0प्र0 प्राविधिक शिक्षा (अध्यापन) सेवा परीक्षा – 2025

ऑनलाइन आवेदन प्रारम्भ होने की तिथि:- 02.12.2025

ऑनलाइन परीक्षा शुल्क बैंक में जमा करने एवं ऑनलाइन आवेदन स्वीकार (Submit) किये जाने की अन्तिम तिथि:- 02.01.2026

ऑनलाइन प्रस्तुत आवेदन में सुधार/संशोधन और शुल्क समाधान (Fee Reconciliation) की अन्तिम तिथि:- 09.01.2026

### महत्वपूर्ण

(1) (a) ऑनलाइन आवेदन करने से पूर्व अभ्यर्थी को O.T.R. पंजीकरण (O.T.R. Registration) कर O.T.R. नम्बर प्राप्त करना अनिवार्य है।  
(b) ऐसे अभ्यर्थी जिन्होंने ओटी0आर0 नम्बर प्राप्त नहीं किया है वे ऑनलाइन आवेदन करने के 72 घंटे पूर्व आयोग की वेबसाइट <https://otr.pariksha.nic.in> से ओटी0आर0 नम्बर प्राप्त कर सकते हैं।  
(c) ओटी0आर0 नम्बर प्राप्त करने के उपरान्त ही आयोग की वेबसाइट <https://luppsc.up.nic.in> पर ऑनलाइन आवेदन सबमिट किया जा सकता है।

(2) अभ्यर्थियों को निर्देशित किया जाता है कि वे ऑनलाइन आवेदन करते समय सभी चरणों (यथा O.T.R., फीस भुगतान, फाइनल सबमिशन, अर्हता से संबंधित संशोधन/त्रुटि सुधार इत्यादि) की सूचनाएं साफ़ पठें और हार्ड कॉपी के रूप में भविष्य हेतु संरक्षित करना सुनिश्चित करें।

(3) अभ्यर्थियों को अपने ऑन-लाइन आवेदन की हार्ड कॉपी के साथ ऑन-लाइन में किये गये समस्त दायों के समर्थन में समस्त अंक पत्र एवं प्रमाण पत्र की रू-प्रमाणित प्रतियां आयोग के निर्देशानुसार यथासमय संलग्न कर प्रेषित करना होगा। इस संबंध में आयोग द्वारा पृथक से प्रेषित विज्ञापित के माध्यम से सूचित किया जायेगा।

**विशेष सूचना :-** (क) आवेदन 'Submit' करने का समूह दायित्व अभ्यर्थी का होगा। बैंक में शुल्क जमा करने की अन्तिम तिथि तक शुल्क जमा करने के बाद ही आवेदन पत्र स्वीकार किया जायेगा।

(ख) अभ्यर्थियों को निर्देशित किया जाता है कि वे अद्यतन सूचनाओं/निर्देशों हेतु आयोग की वेबसाइट का अनवरत अवलोकन करते रहेंगे। O.T.R. के साथ रजिस्टर्ड मोबाइल नम्बर और e-mail ID पर भविष्य में सभी सूचनाओं/निर्देशों एएसएमएस द्वारा अथवा e-mail के माध्यम से प्रेषित किये जायेंगे।

### 1. ऑन-लाइन आवेदन करने वाले अभ्यर्थियों के लिए आवश्यक सूचना

यह विज्ञापन आयोग की Website <https://luppsc.up.nic.in> पर उपलब्ध है। आवेदन करने हेतु इस विज्ञापन में O.T.R. BASED APPLICATION system लागू है। अन्य किसी माध्यम से प्रेषित आवेदन स्वीकार नहीं किये जायेंगे। अतः अभ्यर्थी ऑन-लाइन आवेदन ही करें।

ऑन-लाइन आवेदन करने के सम्बन्ध में अभ्यर्थियों को सूचित किया जाता है कि वे निम्नलिखित निर्देशों को मालीमाँति समझ लें और तदनुसार आवेदन करें:-

आयोग की Website <https://luppsc.up.nic.in> पर "ALL NOTIFICATIONS/ ADVERTISEMENTS" अभ्यर्थी द्वारा Click करने पर ON-LINE ADVERTISEMENT स्वतः प्रदर्शित होगा, जिसमें निम्नलिखित तीन भाग हैं:-

- 1- User Instructions
- 2- View Advertisement
- 3- Apply

**User Instructions** में अभ्यर्थियों को ऑन-लाइन फार्म भरने से सम्बन्धित दिशा-निर्देश दिये गये हैं। अभ्यर्थी इनमें से जिस विज्ञापन को देखना चाहते हैं, उसके सामने "View Advertisement" को Click करें। ऐसा करने पर पूरे विज्ञापन के साथ ऑन-लाइन आवेदन की प्रक्रिया से सम्बन्धित Sample Snapshots भी प्रदर्शित होंगे।

ऑन-लाइन आवेदन करने का कार्य निम्नानुसार चार स्तरों पर किया जायेगा:-

**प्रथम चरण :-** 'Apply' Click करने पर परीक्षा के सापेक्ष 'Authenticate with O.T.R.' प्रदर्शित होगा तथा 'Authenticate with O.T.R.' पर Click करने के उपरान्त 'Have You Completed your O.T.R. Registration' प्रदर्शित होगा, जिसमें अभ्यर्थी को 'Yes' अथवा 'No' पर Tick करना होगा। अभ्यर्थी यदि :-

(i) 'Yes' पर Tick करने के पश्चात् 'Go' बटन पर Click करता है तो 'Enter your O.T.R. Number' प्रदर्शित होगा जिसमें उसे 'O.T.R. Number' भरकर 'Proceed' बटन पर Click करना होगा। 'Proceed' बटन पर Click करने के पश्चात् 'Click here to Authenticate' प्रदर्शित होगा, जिस पर Click करके रजिस्टर्ड मोबाइल नं./ई-मेल पर अभ्यर्थी अपने O.T.P. अथवा O.T.R.-पासवर्ड के माध्यम से Authenticate कर सकते हैं। Authentication की प्रक्रिया पूर्ण करने के पश्चात् अभ्यर्थी की समस्त व्यक्तिगत सूचनायें (जैसा कि O.T.R. में भरी गयी है) स्वतः प्रदर्शित होंगी। अभ्यर्थी को केवल पद के लिए अपेक्षित अनिवार्य अर्हता ही भरनी होगी।

(ii) 'No' पर Tick करने के पश्चात् 'Go' बटन पर Click करता है तो:- a. सर्वप्रथम आवेदक को आयोग के ओ.टी.आर. वेब पोर्टल (<https://otr.pariksha.nic.in>) से एकल अवसरीय पंजीकरण संख्या (ओ.टी.आर. नम्बर) प्राप्त करना होगा। b. ओ.टी.आर. नम्बर प्राप्त करने के पश्चात् प्रथम चरण में वर्णित प्रक्रियानुसार अभ्यर्थी को ऑनलाइन आवेदन करना होगा।

**द्वितीय चरण:-** प्रथम चरण की प्रक्रिया पूरी करने के पश्चात् स्क्रीन पर 'Applicant Dashboard' स्वतः प्रदर्शित होगा। अभ्यर्थी को सम्बन्धित आवेदित पद के सापेक्ष 'Application Part-2' के अन्तर्गत 'Submit Details' पर क्लिक करना होगा जिसके पश्चात् स्क्रीन पर अभ्यर्थी का आवेदन पत्र सहित स्थायी एवं पत्र व्यवहार का पता OTR से स्वतः प्रदर्शित होगा एवं साथ ही पद से सम्बन्धित अधिमाँनी अर्हतायें भी प्रदर्शित होंगी। अभ्यर्थी को विज्ञापित पद के लिए निर्धारित की गयी प्रत्येक अधिमाँनी अर्हताओं के समूह कालम में 'Yes' या 'No' विकल्प का चुनाव करना होगा।

**तृतीय चरण:-** द्वितीय चरण की प्रक्रिया पूरी करने के पश्चात् 'Fee Confirmation Window' स्क्रीन पर स्वतः प्रदर्शित होगी जिसके अन्तर्गत 'Proceed for Fee payment' के समूह 'Yes' विकल्प पर क्लिक करने के पश्चात् 'SBI MOPS' का home page प्रदर्शित होगा जिस पर भुगतान के तीन माध्यम (Mode) प्रदर्शित होंगे:-

- (i) NET BANKING (ii) CARD PAYMENTS (iii) OTHER PAYMENT MODES

उक्त माध्यमों में से किसी एक माध्यम द्वारा निर्धारित शुल्क जमा करने के पश्चात् 'Payment Transaction Slip' प्रदर्शित होगी जिसमें शुल्क जमा करने का पूरा विवरण अंकित रहेगा, जिसका प्रिन्ट आइकन पर क्लिक करके प्राप्त कर लें। 'Payment Failed' होने की स्थिति में अभ्यर्थी 'Candidate Dashboard Login' में जाकर O.T.R. नम्बर भरने के उपरान्त O.T.P. अथवा O.T.R. Password के माध्यम से authentic कर Login करने के उपरान्त 'Pending Payment' पर Click कर ऑनलाइन आवेदन हेतु अनिवार्य रूप से शुल्क भुगतान करें।

नोट:- शुल्क बैंक में जमा करने की निर्धारित अन्तिम तिथि व समय तक अभ्यर्थी द्वारा 'ON-LINE APPLICATION' प्रक्रिया में Payment करना अनिवार्य है। अभ्यर्थी उसका प्रिन्टआउट प्राप्त कर लें और उसे सुरक्षित रखें।

**चतुर्थ चरण :-** तृतीय चरण की प्रक्रिया पूरी करने के पश्चात् स्क्रीन पर अभ्यर्थी का आवेदन पत्र स्वतः प्रदर्शित होगा जिसका प्रिन्ट अभ्यर्थी प्राप्त कर सकते हैं। अभ्यर्थी को ऑनलाइन आवेदन का प्रिन्ट लेकर इसे अपने पास सुरक्षित रखना होगा। किसी विषंगति की दशा में उक्त प्रिन्ट आयोग कार्यालय में अभ्यर्थी को प्रस्तुत करना होगा अथवा अभ्यर्थी का अनुभव/दावा स्वीकार नहीं किया जायेगा। आवेदनोपरांत अर्हता में कोई त्रुटि प्राप्त होने की स्थिति में अभ्यर्थी 'Home Page' के 'Candidate Dashboard Login' पर Click कर आवेदित पद की अर्हता में संशोधन करने हेतु निर्धारित अन्तिम तिथि तक केवल एक बार त्रुटि सुधार कर सकते हैं।

### विशेष अनुदेश

(1) अभ्यर्थियों द्वारा ऑनलाइन आवेदन करने की अन्तिम तिथि/संशोधन तिथि तक ही श्रेणी, उपश्रेणी, डोमिनाइल, लिंग, जन्मतिथि, ई-डब्ल्यू.एस, क्रीमिलेयर, नाम व पते का जो दावा किया जाएगा, वही मान्य होगा। अन्तिम तिथि के बाद कोई भी परिवर्तन सम्बन्धी प्रत्यावेदन स्वीकार नहीं होगा। गलत सूचना प्रस्तुत करने पर अभ्यर्थी निरस्त माना जायेगा।

(2) किसी भी स्तर पर परीक्षागोपरांत यदि वह तथ्य प्रकाश में आता है कि अभ्यर्थी द्वारा कोई सूचना छिपाई गई है अथवा गलत भरी गयी है, तो उसका अभ्यर्थी निरस्त कर दिया जायेगा तथा आयोग के इस परीक्षा व आगामी समस्त चयनों/परीक्षाओं से उसे डिबार (प्रतिवार्जित) एवं अन्य दण्डात्मक कार्यवाही भी की जा सकती है।

(3) उ0प्र0 लोक सेवा आयोग के निर्णय के अनुसार किसी भी अभ्यर्थी को अपने आवेदन पत्र में गलत तथ्यों को, जिनकी

प्रमाण पत्र के आधार पर पुष्टि नहीं की जा सकती है, देने पर अथवा अन्य किसी कदाचार पर आयोग के प्रश्नगत चयन तथा अन्य समस्त परीक्षाओं एवं चयनों से अधिकतम 05 वर्षों तक प्रतिवार्जित (डिबार) किया जा सकता है।

(4) यदि O.T.R. में उल्लिखित व्यक्तिगत सूचना से सम्बन्धित कोई परिवर्तन किया जाना है तो उस परिवर्तन के पश्चात् Dashboard पर Synchronise करना अनिवार्य होगा, अथवा परिवर्तन अनुमत्य नहीं होगा। इस सम्बन्ध में त्रुटि सुधार/संशोधन हेतु कोई भी ऑनलाइन, ऑफलाइन प्रत्यावेदन स्वीकार नहीं किया जायेगा। अपूर्ण आवेदन पत्र सरसरी तौर पर निरस्त कर दिया जायेगा और इस सम्बन्ध में कोई भी पत्राचार स्वीकार नहीं किया जायेगा।

(5) जो अभ्यर्थी कालान्तर में विज्ञापन की शर्तों के अनुसार अर्ह नहीं पाये जायेंगे, उनका अभ्यर्थन/चयन निरस्त कर दिया जायेगा। अभ्यर्थियों के अभ्यर्थन/चयन के सम्बन्ध में आयोग का निर्णय अन्तिम होगा।

(6) आवेदन पत्र निर्धारित प्रारूप पर न होने पर, आवेदन पत्र में जन्मतिथि का उल्लेख न करने पर, त्रुटिपूर्ण जन्मतिथि अंकित करने पर, अधिव्ययक या अल्पव्ययक होने पर, न्यूनतम शैक्षिक अर्हता धारित न करने पर, आवेदन पत्र प्राप्त किये जाने हेतु निर्धारित अन्तिम तिथि के बाद आवेदन पत्र प्राप्त होने पर तथा आवेदन पत्र के घोषणा पत्र के नीचे हस्ताक्षर न करने पर आवेदन पत्र/अभ्यर्थन निरस्त कर दिया जायेगा तथा इस सम्बन्ध में कोई पत्राचार/प्रत्यावेदन स्वीकार नहीं किया जायेगा।

(7) आयोग अभ्यर्थियों को उनके आवेदन पत्र की सरसरी जांच पर औपबन्धिक प्रवेश दे सकते हैं, किन्तु बाद में किसी भी स्तर पर यह पाये जाने पर कि अभ्यर्थी अर्ह नहीं था अथवा आवेदन पत्र प्रारम्भिक स्तर पर ही स्वीकार करने योग्य नहीं था, उसका अभ्यर्थन निरस्त कर दिया जायेगा और यदि चयनोपरांत संस्तुत भी कर दिया गया हो तो आयोग द्वारा संस्तुति वापस ले ली जायेगी।

(8) किसी कदाचार, किसी महत्वपूर्ण सूचना को छिपाने, अभियोजन/आपराधिक वाद लम्बित होने, दोष सिद्ध होने, एक से अधिक जीवित पति या पत्नी के होने, तथ्यों को गलत प्रस्तुत करने तथा अभ्यर्थन/चयन के सम्बन्ध में सिफारिश करने आदि कृत्यों में लिप्त पाये जाने पर अभ्यर्थन निरस्त करने तथा आयोग के प्रश्नगत चयन व आगामी समस्त परीक्षाओं एवं चयनों से प्रतिवार्जित (Debar) करने का अधिकार आयोग को होगा।

(9) अभिलेखों के सत्यापन के समय उपस्थित अभ्यर्थियों द्वारा वांछित अभिलेख प्रस्तुत न करने की दशा में इस हेतु मा0 आयोग के निर्णयानुसार निर्धारित अवधि के अन्तर्गत वांछित अभिलेख प्रस्तुत करना अनिवार्य होगा, उक्त निर्धारित अवधि के अन्तर्गत अभ्यर्थी द्वारा वांछित अभिलेख प्रस्तुत न करने की दशा में अभ्यर्थी का अभ्यर्थन निरस्त कर दिया जायेगा। मूल अभिलेखों के सत्यापन की निर्धारित तिथि को यदि अभिलेख सत्यापन हेतु कोई अभ्यर्थी उपस्थित नहीं होता है तो वह मानते हुए कि वह प्रश्नगत पद हेतु इच्छुक नहीं है, उसका अभ्यर्थन निरस्त कर दिया जायेगा।

**2. आवेदन शुल्क :-** ऑनलाइन आवेदन की प्रक्रिया में प्रथम एवं द्वितीय चरण की कार्यवाही पूर्ण करने के पश्चात् तृतीय चरण में दिये गये निर्देशों के अनुसार श्रेणीवार परीक्षा शुल्क जमा करें। परीक्षा हेतु श्रेणीवार निर्धारित शुल्क निम्नानुसार है :-

- (i) अनारक्षित/आर्थिक रूप से कमजोर वर्ग/अन्य पिछड़ा वर्ग - परीक्षा शुल्क रु. 200/- + ऑनलाइन प्रक्रिया शुल्क रु. 25/- योग = रु. 225/-
- (ii) अनुसूचित जाति/अनुसूचित जन जाति - परीक्षा शुल्क रु. 80/- + ऑनलाइन प्रक्रिया शुल्क रु. 25/- योग = रु. 105/-
- (iii) दिव्यांगजन - परीक्षा शुल्क रु. शून्य + ऑनलाइन प्रक्रिया शुल्क रु. 25/- योग = रु. 25/-
- (iv) भूतपूर्व सैनिक - परीक्षा शुल्क रु. 80/- + ऑनलाइन प्रक्रिया शुल्क रु. 25/- योग = रु. 105/-
- (v) स्वतंत्रता संग्राम सेनानी के आश्रित/महिला/अपनी मूल श्रेणी के अनुसार कुशल खिलाड़ी

**3. उ. प्र. लोक सेवा आयोग उ0प्र0 के जिला/जिलों के विभिन्न परीक्षा-केन्द्रों पर एक लिखित परीक्षा का आयोजन करेगा।** केवल उन अभ्यर्थियों को साक्षात्कार हेतु आहूत किया जायेगा जो लिखित परीक्षा के आधार पर सफल घोषित होंगे। चयन लिखित परीक्षा और साक्षात्कार में प्राप्त कुल अंकों के योग के आधार पर श्रेष्ठता (merit) के अनुसार होगा। लिखित परीक्षा की तिथि तथा केन्द्र की सूचना अभ्यर्थियों को ई-प्रवेश पत्र के माध्यम से अलग से दी जायेगी।

**4. रिक्तियों की संख्या:-** वर्तमान में उ0प्र0 प्राविधिक शिक्षा (अध्यापन) सेवा परीक्षा-2025 हेतु कुल रिक्तियाँ 513 हैं, जिनका विवरण परिशिष्ट-4 में उपलब्ध है।

**नोट:-** (i) रिक्तियों की संख्या परिशिष्टियों एवं आवश्यकतानुसार घट/बढ़ सकती है।  
(ii) प्रश्नगत पद हेतु दिव्यांगजन की केवल एल.बी., एच.एच., ओ.ए., ओ.एल., एल.सी., डी.डब्ल्यू. तथा ए.ए.वी. उपश्रेणियाँ ही चिन्हित हैं।

**पद की प्रकृति:-** समूह 'ख' (उ0प्र0 प्राविधिक शिक्षा (अध्यापन) सेवा) राजपत्रित।  
**वेतनमान:-** लेवल -9 क प्रविष्टि वेतन रु 56100/-

**5. आरक्षण:-** उ0प्र0 की अनुसूचित जातियों/उ0प्र0 की अनुसूचित जनजातियों/उ0प्र0 के अन्य पिछड़े वर्गों/उ0प्र0 के आर्थिक रूप से कमजोर वर्गों के अभ्यर्थियों के लिए आरक्षण विद्यमान शासकीय नियंत्रण के अन्तर्गत दिया जायेगा। इसी प्रकार क्षेत्रीय आरक्षण के अन्तर्गत आने वाली श्रेणियों यथा- उ0प्र0 के स्वतंत्रता संग्राम सेनानियों को भी विद्यमान शासकीय नियंत्रण के अनुसार रिक्तियाँ बनने पर आरक्षण अनुमत्य होगा। उ0प्र0 के समाज के दिव्यांग अभ्यर्थियों के लिए शासन द्वारा अधिसूचित (चिन्हित) किये गये पदों पर आरक्षण अनुमत्य होगा।

**चयन:-** (1) उ0प्र0 के समाज के दिव्यांग अभ्यर्थियों के लिए शासन द्वारा अधिसूचित (चिन्हित) किये गये पदों पर चयन के संबंध में जारी कार्यालय ज्ञाप सं 5/2022/18/1/2008/47 का सं 2022/2022 दिनांक 18 अप्रैल, 2022 के बिन्दू-5 (अनारक्षित रिक्तियों पर नियुक्ति) में प्राविधान निम्नानुसार किया गया है- दिव्यांगता से ग्रस्त व्यक्तियों के लिए उपयुक्त चिन्हित किये गये पदों में दिव्यांगता से ग्रस्त व्यक्ति को किसी अनारक्षित रिक्त पर नियुक्ति के लिए प्रतिस्पर्धा करने से मना नहीं किया जा सकता है अर्थात् दिव्यांगता से ग्रस्त व्यक्ति को किसी अनारक्षित रिक्त पर नियुक्त किया जा सकता है बशर्त कि पद संगत श्रेणी की दिव्यांगता से ग्रस्त व्यक्तियों के लिए चिन्हित किया गया हो।

(2) 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 प्रस्ताव-4 में दिये गये प्राविधान, 'अन्य भी स्पष्ट किया जाता है कि राज्याधीन लोक सेवाओं और पदों पर सीधी भर्ती के प्रक्रम पर महिलाओं को अनुमत्य उपरोक्त आरक्षण केवल उच्च चयन की मूल निवासी महिलाओं को ही अनुमत्य है' को रिट याचिका संख्या 11039/2018 विपिन कुमार मौर्य व अन्य बनाम उत्तर प्रदेश राज्य व अन्य तथा सम्मद्ध 6 अन्य रिट याचिकाओं में मा0 उच्च न्यायालय, इलाहाबाद द्वारा दिनांक-16.01.2019 को अतिकारातीत (ULTRA VIRE) घोषित करने सम्बन्धी निर्णय के अनुपालन में शासनादेश संख्या-09.01.2007 से प्रस्ताव-04 को विलोपित किए जाने का निर्णय लिया गया है। उक्त निर्णय शासन द्वारा मा0 उच्च न्यायालय के आदेश दिनांक-16.01.2019 के विरुद्ध वाद विशेष अपील (डी) संख्या 475/2019 में मा0 उच्च न्यायालय द्वारा प्रस्तुत होने वाले अन्तिम निर्णयों के अधीन होगा।

(3) ई.डब्ल्यू.एस. श्रेणी के अभ्यर्थियों द्वारा उनकी श्रेणी का प्रमाण-पत्र कार्मिक अनुभाग के कार्यालय-ज्ञाप संख्या-11/2019/4/1/2002/का-2/19 टी.सी.-11, दिनांक 18.02.2019 के अनुरूप समस्त प्रोत्तों से प्राप्त आवेदन प्राप्त होने पर चयन करने के वर्ष के पूर्व वर्ष का ही मान्य होगा।

(4) अनुसूचित जाति, अनुसूचित जनजाति, अन्य पिछड़ा वर्ग, आर्थिक रूप से कमजोर वर्ग, स्वतंत्रता संग्राम सेनानियों के आश्रितों, दिव्यांगजन, वगीकृत खेलों के कुशल खिलाड़ी तथा भूतपूर्व सैनिक अभ्यर्थियों को, जो उच्च प्रदेश राज्य के मूल निवासी नहीं हैं, उन्हें आरक्षण/आयु में मूल निवासी अनुमत्य नहीं है।

(5) उ0प्र0 के किसी भी आरक्षित श्रेणी में आने वाले अभ्यर्थी, यदि वे आरक्षण का लाभ चाहते हैं, O.T.R. के सम्बन्धित स्तम्भ में अपनी श्रेणी/उप श्रेणी (एक या एक से अधिक, जो भी हो) अवश्य अंकित करें क्योंकि समस्त व्यक्तिगत

सूचनाएं O.T.R. से स्वतः आवेदन पत्र में प्रदर्शित होंगी।

(d) आरक्षण/आयु में छूट का लाभ चाहने वाले अभ्यर्थी संबंधित आरक्षित श्रेणी के समर्थन में इस विस्तृत विज्ञापन के परिशिष्ट-1 पर उपलब्ध निर्धारित खाल पर सक्षम अधिकारी द्वारा जारी प्रमाण पत्र प्राप्त कर लें एवं जब उनसे अपेक्षा की जाए तब वे उसे आयोग को प्रस्तुत करें।

(e) एक से अधिक आरक्षित श्रेणी/आयु सीमा में छूट का लाभ करने वाले अभ्यर्थियों को केवल एक छूट, जो अधिक लाभकारी होगी, ही देना होगा।

(f) महिला अभ्यर्थियों के मामले में पिता पक्ष से निर्गत जाति प्रमाण पत्र ही मान्य होंगे।

(g) अभ्यर्थियों द्वारा अपने आवेदन में पात्रता तथा आरक्षण का लाभ प्राप्त करने हेतु जिस श्रेणी/उपश्रेणी का दावा किया गया है, उसके समर्थन में समस्त वांछित प्रमाण-पत्रों का स्वप्रमाणित प्रतियों आयोग द्वारा मांगे जाने पर प्रस्तुत किया जाना अनिवार्य है, अन्यथा उनका दावा स्वीकार नहीं किया जायेगा।

**6. अपात कमीशन प्राप्त/अल्पकालिक कमीशन प्राप्त अधिकारियों की पात्रता शर्तें (केवल आयु में छूट हेतु):-** अपात कमीशन प्राप्त/अल्पकालिक कमीशन प्राप्त अधिकारी, जो सेना से अवमुक्त नहीं हुये हैं किन्तु जिनकी सैन्य सेवा में वृद्धि पुनर्वास के लिए की गई है, भी इस परीक्षा के लिए शासनादेश संख्या- 22/10/1976 - कार्मिक-2-85, दिनांक 30 जनवरी, 1985 के अनुसार निम्नलिखित शर्तों पर आवेदन कर सकते हैं:-

(a) ऐसे आवेदकों को थल सेवा/नौ सेना/वायु सेना/नौ सेना/वायु सेना के सक्षम अधिकारी द्वारा जारी इस आशय का प्रमाण पत्र प्रस्तुत करना होगा कि उनकी सेवा में वृद्धि पुनर्वास के लिए की गयी है और उनके विरुद्ध कोई अनुशासनात्मक कार्यवाही लम्बित नहीं है।

(b) ऐसे आवेदकों को यथा समय यह लिखित अपडेटेड प्रस्तुत करनी होगी कि आवेदित पद के लिये चुन लिये जाने पर वे अपने को सैन्य सेवा से तत्काल अवमुक्त करा लेंगे। अपात/अल्पकालिक कमीशन प्राप्त अधिकारी को यह सुविधा अनुमत्य नहीं होगी, यदि

(क) उसे सेना में स्थायी कमीशन प्राप्त हो गया हो।

(ख) वह त्याग पत्र देकर सेना से अवमुक्त हुआ हो।

(ग) वह सेना से कदाचार अथवा शारीरिक अक्षमता के कारण अथवा स्वयं की प्रार्थना पत्र के आधार पर अवमुक्त हुआ हो और जिसे प्रेस्टेडि प्रदान की गई हो।

**7. वैवाहिक स्थिति:-** ऐसे विवाहित पुरुष अभ्यर्थी, जिनकी एक से अधिक जीवित पत्नी हो तथा महिला अभ्यर्थी जिन्होंने किसी ऐसे व्यक्ति से विवाह किया है जिसकी पहले से ही एक पत्नी हो, पात्र नहीं होंगे, जब तक कि महागृहमंत्रि कार्यालय ने उक्त शर्तों से छूट प्रदान न कर दी हो।

**8. शैक्षिक अर्हताएं (ACADEMIC QUALIFICATIONS):-**

**अध्यक्षाता, अधिवेशन और पदाधिकारी शाखाएं, राजकीय पॉलीटेक्निक/लेबर इंस्टीट्यूट/एनआरआई/ओपीडी -**

**(अ) अधिवेशन/प्रायोगिकी :-**

यांत्रिक अभियंत्रण, विद्युत अभियंत्रण, सिविल अभियंत्रण, इलेक्ट्रॉनिक्स अभियंत्रण, केंमिकल अभियंत्रण, कम्प्यूटर, घंट देमालाजी, प्लास्टिक मोल्ड टेक्नोलॉजी, टेक्स्टाइल टेक्नोलॉजी, फुडविशर, टेक्स्टाइल कौमिस्ट्री, लेबर टेक्नोलॉजी, इंस्ट्रुमेंटेशन एण्ड कंट्रोल, व्याख्याता (लेवल-9 क. प्रविष्टि वेतन ₹50 56100/-) की सीधी नती के लिए

सुसंगत शाखा (ए0आई0सी0पी0डी0 द्वारा अनुमोदित डिप्लोमा पाठ्यक्रमों की सूची में यथा प्रगणित) में प्रथम श्रेणी के साथ बी0डी0/बी0टे0/बी0एस0।

व्याख्याता (लेवल-10, प्रविष्टि वेतन ₹50 57700/-) की सीधी नती के लिए

चयन के समय में सुसंगत शाखाओं (ए0आई0सी0पी0डी0 द्वारा अनुमोदित डिप्लोमा पाठ्यक्रमों की सूची में यथा प्रगणित) में स्नातक और स्नातकोत्तर की दो उपाधियों में से एक उपाधि में प्रथम श्रेणी।

**(ब) व्याख्याता (आर्किटेक्चर):-**

व्याख्याता (लेवल-9 क. प्रविष्टि वेतन ₹50 56100/-) की सीधी नती के लिए

यांत्रिक अभियंत्रण में प्रथम श्रेणी के साथ स्नातक/स्नातकोत्तर उपाधि।

व्याख्याता (लेवल-10, प्रविष्टि वेतन ₹50 57700/-) की सीधी नती के लिए

चयन के समय में यांत्रिक अभियंत्रण (आर्किटेक्चर), वास्तुकला (आंतरिक अभियंत्रण डिजाईन), बी.आरके (भवन निर्माण अभियांत्रिकी और निर्माण प्रबंधन), बी.आरके (आर्किटेक्चर अभियंत्रण) (इंटीरियर डिजाईन), आंतरिक अभियंत्रण (इंटीरियर डिजाईन)।

व्याख्याता (लेवल-10, प्रविष्टि वेतन ₹50 57700/-) की सीधी नती के लिए

चयन के समय में सुसंगत शाखाओं (ए0आई0सी0पी0डी0 द्वारा अनुमोदित डिप्लोमा पाठ्यक्रमों की सूची में यथा प्रगणित) में स्नातक और स्नातकोत्तर की दो उपाधियों में से एक उपाधि में प्रथम श्रेणी।

**(क) कर्मशाखा अधीक्षक :-**

व्याख्याता (लेवल-9 क. प्रविष्टि वेतन ₹50 56100/-) की सीधी नती के लिए

यांत्रिक अभियंत्रण में प्रथम श्रेणी के साथ स्नातक/स्नातकोत्तर उपाधि।

व्याख्याता (लेवल-10, प्रविष्टि वेतन ₹50 57700/-) की सीधी नती के लिए

चयन के समय में यांत्रिक अभियंत्रण (आर्किटेक्चर), वास्तुकला (आंतरिक अभियंत्रण डिजाईन), बी.आरके (भवन निर्माण अभियांत्रिकी और निर्माण प्रबंधन), बी.आरके (आर्किटेक्चर अभियंत्रण) (इंटीरियर डिजाईन), आंतरिक अभियंत्रण (इंटीरियर डिजाईन)।

**अध्याक्षाता (अधिवेशन/लेबर) राजकीय पॉलीटेक्निक/राजकीय चर्म संस्था एवं नार्दन पीपुल इंस्टीट्यूट ऑफ प्रिंटींग टेक्नोलॉजी :-**

**विज्ञान और मानविकी :-**

(मौलिक, रसायन, अंग्रेजी, गणित)

व्याख्याता (लेवल-9 क. प्रविष्टि वेतन ₹50 56100/-) की सीधी नती के लिए

समुचित विषय में प्रथम श्रेणी के साथ स्नातकोत्तर उपाधि।

( 'समुचित विषय' से तात्पर्य यह है कि उच्च प्रदेश प्राथमिक शिक्षा (अध्ययन) सेवा नियमावली 2021 में निर्धारित अर्हता के अनुरूप किसी भी शाखा में अनुसूचित विषय के रूप में मौलिक विज्ञान, रसायन विज्ञान व गणित तथा अंग्रेजी/हिन्दी जैसे उपयुक्त विषय-विशेष में प्रथम श्रेणी के साथ स्नातकोत्तर उपाधि।)

**अध्यायनी अर्हता (PREFERENTIAL QUALIFICATIONS):-** अन्वय बाताओं के समान होने पर, ऐसे अभ्यर्थी को अधिमान दिया जायेगा, जिसने-

(i) प्रादेशिक सेना में कम से कम दो वर्ष की अवधि तक सेवा की हो,

या

(ii) राष्ट्रीय कैडेट कोर का 'बी' प्रमाण पत्र प्राप्त किया हो।

**नोट-1.** आवेदन Submit किये जाने की अन्तिम तिथि तक समस्त अर्हताएं पूर्ण होना आवश्यक है।

2. व्याख्याता यांत्रिक अभियंत्रण तथा कर्मशाखा अधीक्षक हेतु अधिमानता साक्षात्कार के समय भराई जायेगी।

3. यदि वर्ग/श्रेणी न प्रदान की गई हो तो कुशल योग का स्मृतनम 60 प्रतिशत अंक प्रथम श्रेणी / वर्ग के समतुल्य समझा जायेगा, यदि ग्रेड प्वाइंट सिस्टम अपनाया जाता है तो सी0जी0पी0ए0 के निम्नानुसार समतुल्य अंकों में सपरिवर्तित किया जायेगा-

ग्रेड प्वाइंट	समतुल्य प्रतिशत
6.25	55%
6.75	60%
7.25	65%
7.75	70%
8.25	75%

**पद की संगत सेवा नियमावली/नियमावली:-**

● उत्तर प्रदेश प्राथमिक शिक्षा (अध्ययन) सेवा नियमावली, 2021

**9. आयु सीमा:-** (i) अभ्यर्थियों को 01 जुलाई, 2025 को 21 वर्ष की आयु अवश्य पूरी करनी चाहिए और उन्हें 40 वर्ष से अधिक आयु का नहीं होना चाहिए अर्थात् उनका जन्म 02 जुलाई, 1985 से पूर्व तथा 01 जुलाई, 2004 के बाद का नहीं होना चाहिए। दिव्यांगन हेतु अधिकतम आयु सीमा 55 वर्ष है अर्थात् अभ्यर्थी का जन्म 2 जुलाई, 1970 के पूर्व का नहीं होना चाहिए।

(ii) अधिकतम आयु सीमा में छूट- (क) 03090 की अनुसूचित जाति, 03090 की अनुसूचित जन जाति, 03090 के अन्य पिछड़ा वर्ग के अभ्यर्थी, 03090 के वर्गीकृत खेतों के कुशल खिलाड़ियों, 03090 राज्य सरकार के कर्मचारियों, 03090 बैरक शिक्षा परिषदीय शिक्षक/शिक्षणोत्तर कर्मचारियों तथा 03090 के अनुदानित माध्यमिक विद्यालयों में कार्यरत शिक्षकों/कर्मचारियों के लिए अधिकतम आयु सीमा में 05 वर्ष की छूट अनुमत्य होगी अर्थात् उनका जन्म 2 जुलाई, 1980 के पूर्व का नहीं होना चाहिए। (ख) 03090 के समाज के दिव्यांग अभ्यर्थियों के लिए अधिकतम आयु सीमा 15 वर्ष अधिक होगी। (ग) 03090 के अपात कमीशन प्राप्त अधिकारियों/अल्पकालिक कमीशन प्राप्त अधिकारियों/भूतपूर्व सैनिकों के लिये अधिकतम आयु सीमा में सेना में की गयी सेवा अवधि + 03 वर्ष के बराबर छूट अनुमत्य होगी।

**10. साक्षात्कार के संबंध में कतिपय सूचनाएं:-** (1) केवल वही अभ्यर्थी साक्षात्कार के लिए आहूत किये जायेंगे जो लिखित परीक्षा के आधार पर सफल घोषित होंगे। (2) अभ्यर्थियों को साक्षात्कार के पूर्व आवेदन पत्रादि भरना होगा। (3) मूल

प्रमाण पत्रों की जाँच साक्षात्कार के समय होगी, उस समय अभ्यर्थियों को दो फोटोग्राफ अपने विभाग/अथवा उस संस्था के प्रधान द्वारा, जहाँ उन्होंने अन्तिम शिक्षा पायी हो अथवा किसी राजपत्रित अधिकारी द्वारा प्रामाणित तथा दो सादे फोटोग्राफ भी प्रस्तुत करना होगा। (4) केन्द्र अथवा राज्य सरकार के अधीन कार्यरत अभ्यर्थियों को साक्षात्कार के समय अपने सेवायोजक का सक्षम प्राधिकारी द्वारा निर्गत अनापत्ति प्रमाण पत्र प्रस्तुत करना होगा। (5) साक्षात्कार के लिए एक घोषित अभ्यर्थियों को साक्षात्कार में उपस्थित होना अनिवार्य होगी।

**11. अभ्यर्थियों के लिये महत्वपूर्ण अनुदेश:-** (1) हाई स्कूल अथवा समकक्ष उत्तीर्ण परीक्षा के प्रमाण पत्र में अंकित जन्मतिथि ही मान्य होगी। अभ्यर्थी को परीक्षा के आवेदन पत्र के साथ हाई स्कूल अथवा समकक्ष परीक्षा का प्रमाण पत्र संलग्न करना होगा। जन्मतिथि हेतु उक्त प्रमाण पत्र के अतिरिक्त अन्य कोई अभिलेख मान्य नहीं होगा तथा उक्त प्रमाण पत्र संलग्न न करने पर आवेदन पत्र निरस्त कर दिया जायेगा।

(2) समाज के दिव्यांग अभ्यर्थियों को 03090 लोक सेवा (शारीरिक रूप से विकलांग, स्वतंत्रता संग्राम सेनानियों के आश्रित और भूतपूर्व सैनिकों) के लिए आरक्षण (संशोधन) अधिनियम, 2021 में उल्लिखित दिव्यांगता से ग्रस्त होने सम्बन्धी प्रमाण पत्र जो सक्षम चिकित्साधिकारी/परिपेक्ष द्वारा निर्गत एवं मुख्य चिकित्साधिकारी द्वारा प्रतिहस्ताक्षरित हो, प्रस्तुत करने पर शासन द्वारा विधिबद्ध किये गये पदों पर दिव्यांग की उप श्रेणी के अन्तर्गत ही आरक्षण का लाभ अनुमत्य होगा।

(3) आवेदन पत्र जमा करने की अन्तिम तिथि तक भूतपूर्व सैनिकों को सैन्य सेवा से अवमुक्त होना आवश्यक है।

(4) परीक्षा की तिथि, समय तथा केन्द्रों आदि के सम्बन्ध में अनुक्रमांक सहित ई-प्रवेश पत्र के माध्यम से सूचना दी जायेगी। अभ्यर्थियों को आवंटित केन्द्र पर ही परीक्षा देनी होगी। परीक्षा केन्द्र परिवर्तन अनुमत्य नहीं होगा तथा इस सम्बन्ध में कोई भी प्रार्थना पत्र स्वीकार्य नहीं होगा।

(5) कदाशय अर्थात् परीक्षा मग्न न करके, अनुशासनहीनता, दुर्व्यवहार तथा अन्य अवांछनीय कार्य करने पर अभ्यर्थी का अर्थव्यय निरस्त कर दिया जायेगा। इन अनुदेशों की अवहेलना करने पर अभ्यर्थी को इस परीक्षा तथा निर्धन्य में होने वाली अन्य समस्त परीक्षाओं/चयनों से प्रतिवारित किया जा सकता है। इस सम्बन्ध में आयोग का निर्णय अन्तिम होगा। उत्तर प्रदेश सार्वजनिक परीक्षा (अनुचित साधनों का निवारण) अधिनियम-2024, दिनांक 06 अगस्त, 2024 के प्राविधान प्रश्नगत परीक्षा में लागू रहेंगे।

(6) आयोग से सभी पत्राचार में परीक्षा का नाम, विज्ञापन संख्या, ओपीडी0आर0 नं०, जन्मतिथि, पिता/पति का नाम तथा अनुक्रमांक (यदि दिया गया हो) का उल्लेख अश्य होना चाहिये।

(7) नियुक्ति हेतु चयनित अभ्यर्थियों को नियमों में अपेक्षित स्वास्थ्य परीक्षण कराना होगा।

(8) लिखित परीक्षा के परिणाम के आधार पर साक्षात्कार हेतु तीन गुना अभ्यर्थी बुलाये जायेंगे।

(9) ऐसे अभ्यर्थी जो पद के लिए निर्धारित अर्हताएँ परीक्षा (पद की अनिवार्य अर्हता) में सम्मिलित हो रहे हैं, वे इस परीक्षा में आवेदन न करें, क्योंकि वे पात्र नहीं हैं।

(10) अभ्यर्थी ऑनलाइन उत्तर पत्रक भरने में केवल काले बॉल प्वाइंट पेन का प्रयोग करें। पेंसिल या अन्य पेन का प्रयोग कदापि न करें।

(11) अभ्यर्थी परीक्षा के समय उत्तर पत्रक (OMR Answer Sheet) पर मांगी गयी सूचना संबंधी गोलों को काला करके सही-सही भरें जो स्कैनर मशीन द्वारा पढ़ी जा सके। OMR Answer Sheet में गोला को काला करके दी गयी सूचना के आधार पर ही आयोग द्वारा OMR Answer Sheet का मूल्यांकन किया जायेगा। उत्तर पत्रक (OMR Answer Sheet) पर खारट/रबर, ब्लेड, पिन अथवा रबर आदि का प्रयोग न किया जाये। उत्तर पत्रक में गोलों को ठीक से काला न करने और कोई भी सूचना त्रुटिपूर्ण भर जाने की स्थिति में आयोग द्वारा OMR Answer Sheet का मूल्यांकन नहीं किया जायेगा। उक्त के लिए अभ्यर्थी स्वयं उत्तरदायी होगा।

(12) वस्तुनिष्ठ परीक्षाओं में माननीय आयोग के निर्णय के क्रम में प्रयुक्त होने वाली उत्तर पत्रक तीन प्रतियों में होगी, जिसमें प्रथम प्रति मूल प्रति- गुलाबी, द्वितीय प्रति संरक्षित प्रति-हरी तथा तीसरी प्रति अभ्यर्थी प्रति-नीली होगी। परीक्षा समाप्त के पश्चात् OMR Answer Sheet की मूल प्रति तथा संरक्षित प्रति अंतरीक्षक जमा करें एवं अपनी तीसरी प्रति (अभ्यर्थी प्रति-नीली) अभ्यर्थी अपने साथ ले जायेंगे।

(13) परीक्षा के वस्तुनिष्ठ प्रकारक प्रश्न पत्रों में गलत उत्तर पर दण्ड (Negative Marking) की व्यवस्था निम्नवत् लागू होगी- 1 प्रत्येक प्रश्न के लिए चार कैलिक्युलर उत्तर हैं। उम्मीदवार द्वारा प्रत्येक प्रश्न के लिए दिये गये एक गलत उत्तर के लिए प्रश्न हेतु नियत लिये गये अंकों का 1/3 (0.33) दण्ड के रूप में काटा जायेगा। 2. यदि कोई उम्मीदवार एक से अधिक उत्तर देता है तो इसे गलत उत्तर माना जायेगा। यद्यपि दिये गये उत्तरों में से एक उत्तर सही होता है फिर भी इस प्रश्न के लिए उपयुक्तानुसार ही उसी तरह का दण्ड दिया जायेगा। 3. यदि उम्मीदवार द्वारा कोई प्रश्न हल नहीं किया जाता है अर्थात् उम्मीदवार द्वारा उत्तर नहीं दिया जाता है तो उस प्रश्न के लिए कोई दण्ड नहीं दिया जायेगा।

(14) अनुसूचित जाति तथा अनुसूचित जनजाति अभ्यर्थियों के लिए न्यूनतम दक्षता मानक (Minimum Efficiency Standard) 35% निर्धारित है अर्थात् इन श्रेणियों के अभ्यर्थी यदि परीक्षा में 35% से कम अंक प्राप्त करते हैं तो वे श्रेण्टा/चयन सूची में सम्मिलित नहीं किये जायेंगे। इसी प्रकार, अन्य श्रेणियों के अभ्यर्थियों के लिए न्यूनतम दक्षता मानक (Minimum Efficiency Standard) 40% निर्धारित है अर्थात् ऐसे अभ्यर्थी यदि परीक्षा में 40% से कम अंक प्राप्त करते हैं तो वे श्रेण्टा/चयन सूची में सम्मिलित नहीं किये जायेंगे। ऐसे सभी अभ्यर्थी आयोग द्वारा निर्धारित न्यूनतम दक्षता मानक (Minimum Efficiency Standard) से कम अंक पाने पर अर्ह नहीं माने जायेंगे।

(15) आरक्षित श्रेणियों के उम्मीदवारों/अभ्यर्थियों को अन्तिम चयन में अनाश्रित श्रेणी के पदों पर तभी समायोजित किया जायेगा जब उनके द्वारा परीक्षा के किसी स्तर पर योग्यता मानक में कोई लाभ/स्थायत न लिया गया हो।

(16) यदि किसी अभ्यर्थी द्वारा कोई प्रमाण पत्र फर्जी अथवा कूटस्थित Submit किया गया गता तो उसे लोक सेवा आयोग के सभी चयनों से सदैव विलेखित किया जायेगा तथा उसके विरुद्ध भारतीय न्याय संहिता (बी.एन.एस.) की संगत धाराओं में कार्यवाही की जायेगी।

(17) जिन अभ्यर्थियों के अर्थव्यय निरस्त कर दिये जाते हैं, अर्थव्यय निरस्त होने के पश्चात् अभ्यर्थी नहीं रह जाते हैं। अतः ऐसे अभ्यर्थियों को उनके प्राप्तांक नहीं दिये जायेंगे।

**सामान्य अनुदेश**

1. अन्तिम नियत तिथि व समय के पश्चात् किसी भी स्तर के आवेदन पत्र किसी भी दशा में स्वीकार नहीं किये जायेंगे। अपेक्षित सूचनाओं से रहित तथा ऐसे आवेदन पत्र जिस पर अभ्यर्थी के फोटो अथवा हस्ताक्षर नहीं होंगे, समय से प्राप्त होने पर भी सरसरी तौर पर निरस्त कर दिये जायेंगे।

2. सभी प्रकार से पूर्ण आवेदन जमा करने की निर्धारित अन्तिम तिथि व समय तक अभ्यर्थी द्वारा 'ON LINE APPLICATION' प्रक्रिया में SUBMIT बटन को CLICK करना अनिवार्य है। अभ्यर्थी अपने द्वारा भरी गयी सूचनाओं का प्रिन्ट प्राप्त कर लें और उसे सुरक्षित रखें। किसी विसंगति की दशा में अभ्यर्थी को उक्त प्रिन्ट आयोग कार्यालय को प्रस्तुत करना होगा अन्यथा अभ्यर्थी का अनुरोध स्वीकार नहीं किया जायेगा।

3. आरक्षण/आयु सीमा में छूट का लाभ चाहने वाले अभ्यर्थी संबंधित आरक्षित श्रेणी के समर्थन में इस विस्तृत विज्ञापन में मुद्रित निर्धारित प्रारूप पर (परिशिष्ट-1) सक्षम अधिकारी द्वारा जारी प्रमाण-पत्र प्राप्त कर लें एवं जब उनसे अपेक्षा की जाये तब वे उसे आयोग को प्रस्तुत करें। एक से अधिक आरक्षित श्रेणी/आयुसीमा में छूट का दावा करने वाले अभ्यर्थियों को केवल एक छूट, जो अधिक लाभकारी होगी, ही देना होगा। अनुसूचित जाति, अनुसूचित जन जाति, अन्य पिछड़ा वर्ग, आर्थिक रूप से कमजोर वर्ग, स्वतंत्रता संग्राम सेनानी के आश्रित, भूतपूर्व सैनिक, कुशल खिलाड़ियों तथा दिव्यांगता से ग्रस्त अभ्यर्थियों को, जो 03090 राज्य के मूल निवासी नहीं हैं, उन्हें आरक्षण/आयु सीमा में छूट का लाभ अनुमत्य नहीं है। महिला अभ्यर्थियों के मामले में पिता पक्ष से निर्गत जाति प्रमाण पत्र ही मान्य होगा।

4. आयोग अभ्यर्थियों को उनकी पात्रता के सम्बन्ध में कोई परामर्श नहीं देते हैं, इसलिए उन्हें विज्ञापन का साधारणीयपूर्वक अध्ययन करना चाहिये और वे तभी आवेदन करें जब वे संतुष्ट हो जायें कि वे विज्ञापन की शर्तों के अनुसार अर्ह हैं। पद के लिए वांछित सभी अर्हताएँ आवेदन पत्र स्वीकार किये जाने की अन्तिम तिथि तक अवश्य शारित करनी चाहिये।

5. स्वतंत्रता संग्राम सेनानियों के आश्रितों की श्रेणी में केवल पुत्र, पुत्री तथा पौत्र (पुत्र का पुत्र/पुत्री का पुत्र) एवं पौत्रियों (पुत्र की पुत्री/पुत्री की पुत्री, विवाहित/अविवाहित) ही आते हैं। इस श्रेणी के अभ्यर्थी आरक्षण विषयक प्रमाण-पत्र शासनादेश संख्या-453/79-बी-1-15-1(का)14-2015, दिनांक 07.04.2015 द्वारा निर्धारित प्रारूप पर विलंबितारित से प्राप्त कर प्रस्तुत करें।

6. यदि अभ्यर्थियों को ऑन-लाइन आवेदन में कोई कठिनाई हो रही है तो आयोग के 'मेल बॉक्स' से अपनी कठिनाई/समस्या का हल प्राप्त कर सकते हैं।

7. विभिन्न आरक्षित वर्गों हेतु आरक्षण संबंधी प्रमाण पत्रों का प्रारूप परिशिष्ट-1 पर उपलब्ध है। इसी प्रकार लिखित परीक्षा की परीक्षा योजना एवं पाठ्यक्रम क्रमशः परिशिष्ट-2 तथा परिशिष्ट-3 पर उपलब्ध है। रिक्तियों का विस्तृत विवरण परिशिष्ट-4 पर उपलब्ध है।

**Detailed Application Form:**  
At the online page there is a 'Declaration' for the candidates. Candidates are advised to go through the contents of the Declaration carefully. Candidate has the option to either agree or disagree with the contents of Declaration by clicking on 'I Agree' or 'I do not agree'

buttons. In case the candidate opts to 'I do not agree', the application procedure will be terminated. Acceptance of 'I Agree' only will make submission of the candidate's Online Application.

**Notification Details**

This section shows information relevant to Notification i.e. Notification type, directorate/department name and post name.

**Personnel Details from OTR**

This section shows information about candidate's personnel details i.e. candidate's name, Father/Husband's name, Gender, D.O.B., UP domicile, Category status, email and contact number, photo & signature, address, Freedom fighter of U.P., Ex-Servicemen of U.P., Service duration, P.H., Skilled Player and Outstanding sports person of U.P., Debarred candidates.

**Education & Experience Details**

It shows your educational and experience details

**Declaration segment**

At the page there is a 'Declaration' for the candidates. Candidates are expected to go through the contents of the Declaration carefully. After filling all above particulars there is provision for preview the detailed submitted application form on clicking Preview button. Preview page will display all facts/particulars that you have mentioned in on-line application form. Being satisfied with filled details click on "Submit" button finally and get the print of submitted application form.

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

For other information candidates are advised to select desired option in the Commission's website <https://uppsc.up.nic.in>

**IMPORTANT ANNOUNCEMENT**

**\*- NOTIFICATIONS/ADVERTISEMENTS**

All Notification/Advertisements

**- ONLINE APPLICATION FORMS SUBMISSION**

- Candidate Registration
- Fee Deposition /Reconciliation
- Submit Application Form
- Modify Submitted Application
- Candidate Dashboard (OTR Based)

**- CANDIDATE'S HELP DESK SECTION**

- Double Verification mode
- View Application Status
- Download Admit Card
- Print Duplicate Registration Slip
- Print Detailed Application Form
- List of Applications Having any Objections
- Know your OTR number.
- View Answer Key

**LAST DATE FOR RECEIPT OF APPLICATIONS:** On-line Application process must be completed (including filling up of OTR, 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**

उ0प्र0 की अनुसूचित जाति तथा अनुसूचित जनजाति के लिये जाति प्रमाण-पत्र (प्रारूप-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 ..... निवासी ..... तहसील ..... नगर ..... जिला ..... उत्तर प्रदेश राज्य की ..... पिछड़ी जाति के व्यक्ति हैं। यह जाति उ0प्र0 लोक सेवा (अनुसूचित जातियों, अनुसूचित जनजातियों और 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 उ0प्र0 लोक सेवा (अनुसूचित जातियों, अनुसूचित जनजातियों और अन्य पिछड़े वर्गों के लिये आरक्षण) (संशोधन) अधिनियम, 2001 द्वारा प्रतिस्थापित किया गया है एवं जो उ0प्र0 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-1)**

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:-

- I. 5 (पाँच) एकड़ कृषि योग्य भूमि अथवा इससे ऊपर।
- II. एक हजार वर्ग फीट अथवा इससे अधिक क्षेत्रफल का प्लॉट।
- 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।

2. श्री/श्रीमती/कुमारी ..... जाति ..... के सदस्य हैं, जो अनुसूचित जाति, अनुसूचित जनजाति तथा अन्य पिछड़े वर्गों के रूप में अधिसूचित नहीं है।

आवेदक का पासपोर्ट साईज का अभिप्रमाणित फोटोग्राफ

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 ..... ब्लाक ..... 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 (वैतन, कृषि, व्यवसाय, पेशा इत्यादि) से कुल वार्षिक आय रु. .... (शब्दों में) है।
3. मेरे परिवार के पास उल्लिखित आय के सिवाय अथवा इसके अतिरिक्त अन्य 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 प्लॉट।
- 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 में 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:-

उ0प्र0 के दिव्यांग व्यक्तियों के लिये प्रमाण-पत्र

(दिव्यांगजन प्रारूप)

**Form-II**

**Certificate of Disability**

(In cases of amputation or complete permanent paralysis of limbs or dwarfism and in case of blindness) (Name and Address of the Medical Authority issuing the Certificate)

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

**Certificate No.**

**Date:**

This is to certify that I have carefully examined Shri/Smt./Kum. .... son/wife/daughter of Shri ..... Date of Birth (DD/MM/YY) ..... Age ..... years, male/female ..... registration No. .... permanent resident of House No. .... Ward/Village/Street ..... Post office ..... District ..... State .....

whose photograph is affixed above, and am satisfied that:

- (A) he/she is a case of:
  - locomotor disability
  - dwarfism
  - blindness
(Please tick as applicable)
- (B) The diagnosis in his/her case is \_\_\_\_\_
- (A) he/she has .....% (in figure).....percent (in words) permanent locomotor disability/ dwarfism/blindness in relation to his/her ..... (part of body) as per guidelines (.....number and date of issue of the guidelines to be specified).

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

Nature of Document	Date of Issue	Details of authority issuing certificate

3. Signature and seal of the Medical Authority.

(Dr.....) (Dr.....) (Dr.....)  
Member Member Chairperson  
Medical Board Medical Board Medical Board  
with seal with seal with seal

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

Countersigned by the Chief Medical Officer (with seal)

**Form-III**

**Certificate of Disability**

**(In cases of multiple disabilities)**

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

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

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

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

S. N.	Disability	Affected part of body	Diagnosis	Permanent physical impairment/ mental disability (in%)
1.	Locomotor disability	@		
2.	Muscular Dystrophy			
3.	Leprosy cured			
4.	Dwarfism			
5.	Cerebral Palsy			
6.	Acid attack Victim			
7.	Low Vision	#		
8.	Blindness	#		
9.	Deaf	£		
10.	Hard of Hearing	£		
11.	Speech and Language disability			
12.	Intellectual Disability			
13.	Specific Learning Disability			
14.	Autism Spectrum Disorder			
15.	Mental illness			
16.	Chronic Neurological Conditions			
17.	Multiple sclerosis			
18.	Parkinson's disease			
19.	Haemophilia			
20.	Thalassemia			
21.	Sickle Cell disease			

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

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

**3. Reassessment of disability is:-**  
 (i) not necessary,  
 or  
 (ii) is recommended/ after..... years.....months, and therefore this certificate shall be valid till.....  
 (DD) (MM) (YY)  
 @ -e.g. Left/right/both arms/legs  
 # - e.g. Single eye  
 £ - e.g. Left/Right/both ears

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

Nature of Document	Date of Issue	Details of authority issuing certificate

5. Signature and seal of the Medical Authority.

Name and Seal of Member	Name and Seal of Member	Name and Seal of the Chairperson
Signature/thumb impression of the person in whose favour certificate of disability is issued		Countersigned by the Chief Medical Officer (with seal)

**Form-IV**

**Certificate of Disability**

(In cases of other than those mentioned in Forms II and III)  
 (Name and Address of the Medical Authority/Board issuing the Certificate)

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

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

S. N.	Disability	Affected part of body	Diagnosis	Permanent physical impairment/ mental disability (in%)
1.	Locomotor disability	@		
2.	Muscular Dystrophy			
3.	Leprosy cured			
4.	Cerebral Palsy			
5.	Acid attack Victim			
6.	Low Vision	#		
7.	Deaf	£		
8.	Hard of Hearing	£		
9.	Speech and Language disability			
10.	Intellectual Disability			
11.	Specific Learning Disability			
12.	Autism Spectrum Disorder			
13.	Mental illness			
14.	Chronic Neurological Conditions			
15.	Multiple sclerosis			
16.	Parkinson's disease			
17.	Haemophilia			
18.	Thalassemia			
19.	Sickle Cell disease			

Please strike out the disabilities which is not applicable)  
 2. The above condition is progressive/non-progressive/likely to improve/not likely to improve.

3. Reassessment of disability is:-  
 (i) not necessary,  
 or  
 (ii) is recommended/after.....years..... months, and therefore this certificate shall be valid till (DD/MM/YY).....  
 @ e.g. Left/right/both arms/legs  
 # e.g. Single eye/both eyes  
 £ e.g. Left/Right/both ears

4. Signature and seal of the Medical Authority.

Name and Seal of Member	Name and Seal of Member	Name and Seal of the Chairperson
Signature/thumb impression of the person in whose favour certificate of disability is issued		Countersigned by the Chief Medical Officer (with seal)

उत्तर प्रदेश लोक सेवा (शाहीरक रूप से विकलांग, स्वतंत्रता संग्राम सेनानियों के आश्रितों और भूतपूर्व सैनिकों के लिए आरक्षण), अधिनियम, 1993 (यथासंशोधित) के अनुसार स्वतंत्रता संग्राम सेनानी की आश्रित के लिए प्रमाण-पत्र का प्रारूप

प्रमाण-पत्र  
 प्रमाणित किया जाता है कि श्री/ श्रीमती/ कुमारी ..... निवासी ..... ग्राम ..... तहसील ..... नगर ..... जिला ..... उत्तर प्रदेश लोक सेवा (शाहीरक 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) उपर्युक्त अधिनियम 1993 (यथासंशोधित) के प्रावधानों के अनुसार उक्त श्री/ श्रीमती (स्वतंत्रता संग्राम सेनानी) ..... के आश्रित हैं।  
 स्थान ..... हस्ताक्षर .....  
 दिनांक ..... 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)

प्रारूप - 1  
 सम्बन्धित खेल की राष्ट्रीय फेडरेशन/ राष्ट्रीय एसोसिएशन का नाम ..... राज्य सरकार की सेवाओं/ पदों पर नियुक्त 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/ दूर्गमिन्ट में देश की ओर से भाग लिया।  
 उनके टीम के द्वारा उक्त प्रतियोगिता/ दूर्गमिन्ट 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 नियुक्त 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 (दूर्गमिन्ट स्थान का नाम) आयोजित राष्ट्रीय ..... में (क्रीड़ा/ खेल-कूद का नाम) की प्रतियोगिता/ दूर्गमिन्ट में प्रदेश की ओर से भाग लिया।  
 उनके टीम के द्वारा उक्त प्रतियोगिता/ दूर्गमिन्ट 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 इन्स्ट्रक्शन्स/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 ..... (क्रीड़ा/खेल-कूद का नाम) प्रतियोगिता/टूर्नामेंट में ..... स्थान प्राप्त किया गया।  
 उनके टीम के द्वारा उक्त प्रतियोगिता/टूर्नामेंट में ..... स्थान प्राप्त किया गया।  
 यह प्रमाण-पत्र डाइरेक्ट्रेट ऑफ पब्लिक इन्स्ट्रक्शन्स/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 इन्स्ट्रक्शन्स/शिक्षा द्वारा व्यक्तिगत रूप से हस्ताक्षर होने पर मान्य होगा।

**APPENDIX - 2**  
**परीक्षा योजना**

प्राथमिक शिक्षा विभाग (डिप्लोमा सेक्टर) CBSE के अन्तर्गत व्याख्याता व कर्मशाला अधीक्षक परीक्षा हेतु निम्नवत दो प्रश्न-पत्र होंगे-  
**प्रथम प्रश्न-पत्र (व्याख्याता व कर्मशाला अधीक्षक हेतु)**

विषय	प्रश्नों की संख्या	अंक	कुल अंक	समय
1-सामान्य हिन्दी	25 (प्रत्येक प्रश्न 03 अंक)	75		
2-मुख्य विषय (यांत्रिक अभि०-1, विद्युत अभि०-1, सिविल अभि०-1, इलेक्ट्रॉनिक्स अभि०-1, केमिकल अभि०-1, कम्प्यूटर-1, पेंट टेक्नो०-1, टेक्सटाइल टेक्नो०-1, लेदर टेक्नो०-1, प्लास्टिक मोल्ड टेक्नो०-1, वास्तुकला (आर्कीटेक्चर)-1, टेक्सटाइल केमेस्ट्री-1, भौतिकी-1, रसायन-1, अंग्रेजी-1, गणित-1, इन्स्ट्रूमेंटेशन एण्ड कन्ट्रोल-1, फुटविपर टेक्नो०-1, कर्मशाला अधीक्षक (यांत्रिक अभि० में स्नातक/स्नातकोत्तर)-1)	100 (प्रत्येक प्रश्न 03 अंक)	300	375	2.30 (त्राई) घण्टा

**द्वितीय प्रश्न-पत्र (व्याख्याता व कर्मशाला अधीक्षक हेतु)**

विषय	प्रश्नों की संख्या	अंक	कुल अंक	समय
1-सामान्य अध्ययन	25 (प्रत्येक प्रश्न 03 अंक)	75		
2-मुख्य विषय (यांत्रिक अभि०-1, विद्युत अभि०-1, सिविल अभि०-1, इलेक्ट्रॉनिक्स अभि०-1, केमिकल अभि०-1, कम्प्यूटर-1, पेंट टेक्नो०-1, टेक्सटाइल टेक्नो०-1, लेदर टेक्नो०-1, प्लास्टिक मोल्ड टेक्नो०-1, वास्तुकला (आर्कीटेक्चर)-1, टेक्सटाइल केमेस्ट्री-1, भौतिकी-1, रसायन-1, अंग्रेजी-1, गणित-1, इन्स्ट्रूमेंटेशन एण्ड कन्ट्रोल-1, फुटविपर टेक्नो०-1, कर्मशाला अधीक्षक (यांत्रिक अभि० में स्नातक/स्नातकोत्तर)-1)	100 (प्रत्येक प्रश्न 03 अंक)	300	375	2.30 (त्राई) घण्टा

व्यक्तित्व परीक्षा (साक्षात्कार) - 100 अंक  
 कुल योग - 375+375+100=850

**परिशिष्ट-3**  
**पाठ्यक्रम**  
**सामान्य हिन्दी**  
**(व्याख्याता/कर्मशाला अधीक्षक पद हेतु)**

(इसका स्तर हाईस्कूल का होगा)  
 1-हिन्दी-वर्णविचार-स्वर एवं व्यंजन  
 2-पर्यायवाची शब्द  
 3-विलोम शब्द  
 4-अनेक शब्दों के लिए एक शब्द/वाक्यांश के लिए एक शब्द  
 5-अनेकार्थक शब्द  
 6-उपसर्ग एवं प्रत्यय  
 7-अशुद्धि-शोधन-वर्तनी-शुद्धि, वाक्य-शुद्धि  
 8-तत्सम-तद्भव शब्द  
 9-शब्द-युग्म, अर्थबोध (शब्दार्थ)

10-मुलावरे एवं लोकोवित्तार्थ  
 11-सन्धि, समास  
 12-विरामचिह्न  
 13-कारकचिह्न  
 14-हिन्दी-व्याकरण-संज्ञा, सर्वनाम, विशेषण, क्रिया, अव्यय, लिंग, वचन।

**सामान्य अध्ययन**  
**(व्याख्याता/कर्मशाला अधीक्षक पद हेतु)**

1. भारतीय इतिहास
  2. भारत का भूगोल
  3. भारतीय राजनीति और संविधान
  4. महत्वपूर्ण राष्ट्रीय एवं अन्तर्राष्ट्रीय घटनाक्रम।
1. **भारतीय इतिहास** के अन्तर्गत अमर्थियों से इतिहास के विविध पक्षों यथा राजनीति, अर्थव्यवस्था एवं सामाजिक-व्यवस्था के सामान्य अवबोध की अपेक्षा की जाती है।  
 2. **भारत का भूगोल** के अन्तर्गत अमर्थियों से भारत के भौतिक और मानव भूगोल के विविध आयामों की सामान्य संदर्भों में समझ की अपेक्षा की जाती है।  
 3. **भारतीय राजनीति और संविधान** के अन्तर्गत अमर्थियों से भारतीय प्रशासनिक व्यवस्था और भारतीय संविधान के आधारभूत पक्षों की सामान्य जानकारी की अपेक्षा की जाती है।  
 4. **महत्वपूर्ण राष्ट्रीय एवं अन्तर्राष्ट्रीय घटनाक्रम।**

**1. MECHANICAL ENGINEERING/WORKSHOP SUPERINTENDENT**  
**PAPER-I**

- 1. Engineering Mechanics:**  
 Analysis of Force Systems, Friction, Centroid and Centre of Gravity, Trusses, Bending Moment and Shear Force diagrams, Kinematics and Kinetics of Rigid Bodies.
- 2. Mechanisms and Machines:**  
 Velocity and Acceleration analysis, Cams and Followers, Gears and gear trains, Clutches, Brakes and Dynamometers, Flywheel and Governors, Brakes and Dynamometers, Balancing of rotating and Reciprocating Masses, Balancing of Multi Cylinder Engines, Free and Forced Vibration, Gyroscopic Stabilization, Whirling of Shafts.
- 3. Mechanics of Solids:** Stresses and Strains, Compound Stresses and Strains, Torsion of circular Shafts, Slope and Deflection, Unsymmetrical bending, Curved Beams, Thin and Thick Cylinders, thin Spheres, Helical and Leaf Springs, Buckling of Columns.
- 4. Design of Machine Elements:** Design for Static and Dynamic Loading, Theories of failures, Fatigue, Design of Rivetted, Welded and Bolted Joints, Shafts, Gears, Bearings, Clutches and Brakes.
- 5. Engineering Materials:** Crystal Systems and Crystallography, Crystal Imperfections, Phase Diagrams, Iron Carbon Equilibrium Diagram, Heat Treatment, Ferrous and Non Ferrous Metals and Alloys, Mechanical Properties and Testing.
- 6. Manufacturing:** Metal Casting, Metal joining, Metal forming, Mechanics of Metal cutting, Machining and Machine Tool Operations, Unconventional Machining, Limits, Fits and Tolerances, Inspection: Surface Roughness and its measurement; Comparators, Computer Integrated Manufacturing, Flexible Manufacturing Systems, Jigs and Fixtures.
- 7. Industrial Engineering:** Production Planning and Control, Inventory Control, Operations Research, CPM and PERT.
- 8. Mechatronics and Robotics:** Microprocessors and Micro Controllers, Architecture, Programming, Computer Interfacing, Programmable Logic Controllers, Sensors and Actuators, Piezoelectric Accelerometers, Hall Effect Sensors, Optical Encoder, Resolver, Inductosyn, Pneumatic and Hydraulic Actuators, Stepper Motor, Control System, Mathematical Modelling of Physical Systems, Control Signals, Controllability and Observability. Robotics : Robot Classification, Robot Specification, Notation, Direct and Inverse Kinematics, Homogeneous Coordinates and Arm Equations of four Axis SCARA Robot.

**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, 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 Radiative heat transfer, Stefan-Boltzmann law, Shape Factor, Black and Grey Body radiation, heat exchanger, Boiling and Condensation, Heat Exchanger Performance Analysis, LMTD and NTU-Effectiveness Methods.
- 4. Energy Conversion:** SI and CI engines, Performance Characteristics and Testing of IC Engines, Fuels, Combustion Phenomena in SI and CI Engines, Carburetion and Fuel Injection Systems, Emission and Emission Control, Reciprocating and Rotary Pumps, Pelton wheels, 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 Drafts, Condensers. Unconventional Power Systems Including Nuclear, MHD, Biomass, Wind and Tidal Systems. Utilization of Solar Energy, Reciprocating and Rotary Compressor; 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, Psychrometric Properties and Processes, Psychrometric Relations, Use of Psychrometric chart, Load Estimation, Supply Air Conditions, Sensible Heat Factor, Air Conditioning; System Layout, Comfort Chart, Comfort and Industrial Air Conditioning.

**2. ELECTRICAL ENGINEERING**  
**PAPER-I**

- Electrical Circuits and Networks:** Circuit elements, KCL, KVL, Nodal and Mesh analysis, Thevenin's, Norton's, Superposition and Maximum power transfer theorems, Steady state and Transient Response of DC and AC networks, Two-part networks, Magnetically coupled circuits.
- Electromagnetic Field Theory:** Electrostatic fields; Gauss's Law, Maxwell's equations, Energy density in electrostatic fields, Properties of materials Magnetostatic Fields: Biot-Savart's Law, Ampere's circuit law, Maxwell's equations, Application of Ampere's law, Waves and applications.
- Basic Electronics Engineering:** Basics of Semiconductor diodes BJT, FET, MOSFETS characteristics, Different types amplifiers, equivalent circuit and frequency response, Oscillator and other circuits, feedback amplifiers.

**Electrical and Electronics Measurements:** Principles of measurement, Accuracy, Precision, Errors, Moving coil, Moving iron, Dynamometer and induction types of instruments, Measurement of voltage, Current, Power, Energy and Power factor, Instrument transformer, Bridges and Potentiometers, Electronic instruments, Digital voltmeters, Phase Frequency measurement, Q-meters, Basics for sensors and transducers.

**Electrical Machines:** Electro Magnetic Energy conversion (EMEC), DC Machines-types, Generator and motor characteristics, Starting and control of motors; Synchronous machines- Principle and performance, Regulation, Paralled operation of generators, Motor starting, Characteristics and application, Single phase, Three phase transformers-Principle, Equivalent circuit efficiency, Regulation, Connections.

**Power Systems:** Basic power generation concepts- Steam, gas and water turbines, Line parameters and calculations, Performance of transmission lines, Mechanical design of overhead lines and insulators, Corona and radion interference, Power factor correction, Symmetrical components, Fault analysis, Load flow equations and methods of solutions, Power system stability- Power system transients and travelling waves, EHV transmission, HVDC transmission, Concepts of FACTS, Voltage control and Economic operation, Concepts of distributed generations, Solar and wind power, Smart grid Concept.

**Control System:** Mathematical modelling of physical systems, Principles of feedback, Transfer function, Block Diagram and signal flow graphs, Time response specification, Routh-Hurcoitz criterion, Bode plots, root loci, Nyquist technique, Lag, Lead and lead-lag compensation, stability analysis, transient and frequency response analysis, State space model, State transition matrix, Controllability and observability, PID and industrial controllers.

#### PAPER-II

##### Analog and Digital Electronics:

Operational amplifiers- Characteristics and applications, combinational and sequential circuits, Multiplexers, Multivibrators, Sample and hold circuits, A/D and D/A converters, Basics of filter circuits and applications, Active filters, Microprocessor basics- Interfaces and applications, Basics of integrated circuits, Analog communication basics, Modulation and Demodulation, Noise and bandwidth Signal to noise ratio, Transmitters and receivers, Digital communication basics- sampling, quantizing, coding, frequency and time domain multiplexing, Power line carrier communication systems.

**Systems and Signal Processing:** Representation of continuous and discrete-time signals, Shifting and scaling operations, Linear, time-invariant and causal systems, Fourier series representation of continuous periodic signals, Sampling theorem, Fourier and Laplace transform, Z-transforms, Discrete Fourier transform, FFT, Linear convolution, FIR and IIR filters, bilinear transformation.

**Induction and Special Machines:** Three-Phase induction motors- rotating magnetic field theory, Equivalent circuit and determination of its parameters, Torque-slip characteristics, Starters, Speed control, induction generators, Single-phase induction motors- theory, Characteristics, Starting and applications, Servomotors, Stepper motors, brushless DC (BLDC) motors.

**Power System Protection:** Principles and need for protection schemes, Types of faults, Relay application and Characteristics- over current relays, Directional relays, Distance relay, Differential relays, Methods of Arc extinction, Restriking voltages and recovery voltage, testing of circuit breakers, Protective schemes for power system equipment, Surge in transmission line and protection.

**Power Electronic and Drivers:** Semiconductor power diodes, Transistors, Thyristors, Triacs, GTOs, MOSFETs, IGBTs- principles of operation and their static characteristics, Triggering circuits, Phase control rectifiers, Bridge converters- fully controlled and half controlled, Principle of choppers and inverters, Basic concepts of adjustable speed DC and AC drives, DC-DC switched mode converters, DC-AC switched mode converters, Resonant converters, Basics of electric drives- types, quadrant operation, Reversing and braking of electric motors, Estimation of power ratings, Traction motors.

**Electrical Material:** Electrical engineering materials, Crystal structures and defects, Ceramic materials, Insulating materials, Magnetic materials- basics, Properties and applications; Ferrites, Ferro-magnetic materials and components, Basics of solid state Physics, Conductors, Photo-conductivities, Basics of Nano materials and superconductors.

### 3. CIVIL ENGINEERING

#### PAPER-I

##### Part - A

**Engineering Mechanics:** Force Systems, Rigid Body equilibrium; Coplanar Concurrent forces, Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of coplanar Systems. Laws of Friction, Static and Dynamic Friction. Centroid and Centre of Gravity, Centroid of Simple figures, centroid of composite sections, Moment of inertia of plane sections, Moment of inertia of standard sections and composite sections, Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Basic Structural Analysis, Equilibrium in three dimensions, analysis of simple trusses, Simple beams and support reactions. Rectilinear motion, Plane curvilinear motion, Work-kinetic energy, power, potential energy. Impulse-momentum, Impact, Kinetics of Rigid Bodies, D'Alembert's principle and its applications in plane motion, Work energy principle, Kinetics of rigid body rotation, Virtual Work and Energy Method.

**Strength of Materials :** Types of stresses and strains, Hook's law, stress and strain diagram for ductile and brittle metal. Lateral strain, Poisson ratio, volumetric strain, elastic moduli and relation between them, composite bar, Mohr's stress circle, three dimensional state of stress & strain, Shear force (SF) and Bending moment (BM) diagrams for simply supported, cantilevers, overhanging and fixed beams. Flexural Stresses-Theory of simple bending, bending stresses, Design of simple beam sections, Derivation of torsion equation, Combined torsion and bending of circular shafts, Shear stress distribution across various beam sections rectangular, circular, triangular, Slope and deflection – Relationship between moment, slope and deflection, Moment area method, Macaulay's method, short Columns and Struts : Buckling and stability, slenderness ratio.

**Structural Analysis :** Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of determinate plane trusses. Method of substitution, method of tension coefficient for analysis of plane trusses, Castigliano's theorems, Calculations of deflections: Strain Energy method and unit load method for statically determinate beams, frames and trusses. Deflection of determinate beams by Conjugate beam method. Rolling loads and influence line diagrams for determinate beams and trusses, Types of Arches, Analysis of three hinged parabolic and circular Arches. Moving load & influence lines for three hinged parabolic arch.

##### Part – B

**Structural Steel Design :** Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Limit State Design, Limit States of Strength, Limit States of Serviceability, Actions, Probabilistic Basis for Design. Riveted, Bolted and Pinned Connections, Patterns of riveted Joints,

Bolted Connection, Types of Bolted Joints, Failure of Bolted Joints, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Welded Connections, types, Weld Defects, Failure of welds, Design of eccentric welded connections. Types of Tension Members, Sectional Area, Types of Failure, Slenderness Ratio, Design of Tension Member, Lug Angles, Splices, Gusset Plate. Compression Members, Types of Buckling, Classification of Cross Sections, column formula, Built-Up columns, Lacing, Batten, Splices, Types of Beam Sections, Lateral Stability of Beams, Bending Strength of Beams, Shear Strength of Beams, Web Buckling, Built-Up Beams (plated Beams), Purlins, Effect of Holes in Beam, Plate Girder, Gantry Girder.

**Design of Concrete & Masonry Structure :** Design of Rectangular singly and doubly reinforced Sections by working Stress Method. Assumptions in Limit State Design method, Design of Rectangular Singly and doubly Reinforced beams, T-Beams, L-beams by Limit State Design Method. Shear Strength of beams with and without shear reinforcement, development length, Anchorage bond, flexural bond. Limit State Design method, Failure of beam under shear. Design of one way, one way continuous and cantilever solid slabs by Limit State Design Method, Design of two way slabs by limit state method, Design of columns by Limit State Design Method, Short column under axial load and uni-axial bending, Design of isolated footings, combined rectangular and trapezoidal footings by Limit State Method, Design of strap footings. Structural behavior of retaining wall, stability of retaining wall against overturning and sliding, design of cantilever retaining wall by Limit State Method.

##### Part - C

**Building Materials :** Stones : Requirement of good building stone, Bricks : Properties of clay bricks, Different types of bricks. Gypsum, Cement, Types of cement, Testing of cement properties, Cement Concrete, Grades of concrete, Testing of concrete, Pozzolona, Chemical composition and requirements for uses, Timber, Properties of timber, Defects in timber, Methods of seasoning and preservation of timber, Asphalt : Bitumen and Tar. Plastics, Paints, varnishes and distempers, properties and uses of aluminum and lead, Insulating Materials, Thermal and sound insulating material, Building, construction Principle and Methods for layout, Damp proofing, anti termite treatment in buildings, stair cases and their types and planning, types of floors, Bricks and stone masonry construction, Wall, Doors and Windows, roof and roof treatments, Lintel Principles of building Planning, Natural Ventilation, Water Supply and Sanitary fittings, Methods of building maintenance.

**Construction Management :** Quantity Estimation for Buildings, Centreline method, Long and short wall method of estimates, Types of estimates, Rate Analysis, Specification and Tenders, Different types of contracts, process of tendering, management system in construction, Bar charts, preparation of networks, PERT & CPM in construction management, Project Cost Management, Basic principle of financial planning.

##### Part - D

**Geotechnical Engineering and Foundation Engineering :** Origin and classification of Soils, Weight volume relationships, Clay minerals, Index properties, sensitivity and thixotropy, Particle size analysis, Unified and Indian standar soil classification system. Soil Hydraulics, Soil Permeability – Darcy's Law, hydraulic conductivity, equivalent hydraulic conductivity in stratified soil, Seepage, flow nets, critical hydraulic gradient and quick sand condition, uplift pressure, piping, Phenomena , Soil compaction, field compaction control, consolidation, Primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Normal and Over Consolidated soils, Over Consolidation Ratio, Stress Distribution in soil, Boussinesq equation for vertical stress, The Westergaard equation, Stress distribution under loaded areas, Concept of pressure bulb, contact pressure, Shear Strength : Mohr-Coulomb failure criterion, shear strength parameters, pore pressure, Soil liquefaction, Earth pressure, Coulomb and Rankine's approaches for fictional and c-φ soils, Stability of slopes – finite and infinite slopes, types of slope failure, coulomb's wedge theory, subsurface exploration. Shallow and Deep foundations, Bearing Capacity estimation, Pile foundations, Well foundations.

#### PAPER-II

##### Part – A

**Fluid Mechanics :** Physical properties of fluids, Pressure-density height relationship, manometers, pressure on plane and curved surfaces, buoyancy, stability of immersed and floating bodies. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, path lines, streak lines, stream tube, continuity equation for 1-D, 2-D and 3-D flows, stream function and velocity potential function. Bernoulli's equation and its applications – Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation, siphon, water hammer, laminar flow through pipes, Stokes' law, velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, displacement, momentum and energy thickness. Laminar boundary layer, turbulent boundary layer, laminar sub-layer, separation and its control. Vortex flow : Free & Forced. Drag and lift, Buckingham's Pi theorem, dimensionless numbers and their significance.

**Open Channel Flow :** Free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Uniform flow: Standard equations, Equation of gradually varied flow and its limitations, Transitions of subcritical and supercritical flow, Rapidly Varied flow (RVF), Hydraulic jump, flow measurement, critical depth flumes, sluice gate, Free over fall. Rapidly varied unsteady flow, "Celerity" of the gravity wave, Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert. Free surface flows, Specific energy and specific force. Chezy's and Manning's equations for uniform flow in open channel. Measurements of discharge & velocity – Venturi flume.

**Hydraulic Machines :** Reciprocating pumps, centrifugal pumps theory and Cavitation, Rotodynamic Machines, Pelton Turbine, reaction turbines, Francis and Kaplan type, Hydraulic turbines, Hydro Power development.

##### Part – B

**Hydrology :** Hydrologic cycle, Precipitation, Evaporation, Evapotranspiration, Infiltration process, Runoff characteristics of stream, mass curve. Hydrograph, Factors affecting flood hydrographs, hydrograph and its analysis, s-curve hydrograph, aquifers & its properties, confined and unconfined aquifers, rainwater harvesting and recharge.

**Water Resources Engineering :** Methods of Irrigation, Water requirement of crops, crop rotation. Canal irrigation, Parts of a canal system, Sediment Transportation, Irrigation channels and Design, silt theories: Kennedy's and Lacey's Design, Lining of Irrigation Canals, Economics of canal lining, Water Logging and Drainage Design, Regulation and control of canal system, Irrigation Outlets, river training works, Types of Head works, Failure of hydraulic structures, Principles of design, Bligh's theory, Khosla's theory for

pressure and exit gradient. Design of Sarada type and straight glacis fall. Design of distributor head regulator and cross regulator, canal escape, Bed bars, Canal head works, Design of Weir, Barrage and Canal head Regulator, Cross drainage works: Necessity and types, design principles of cross drainage works, planning of dams and Reservoirs, Estimation of storage capacity, Earth Dams, Gravity dams, Spillways and their design.

**Part – C**

**Transportation Engineering :** History of road development, Geometric Design, Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. Traffic studies on flow, speed, travel time – delay and O-D study, PCU, peak hour factor, accident study, traffic capacity, density, traffic control devices, Types of Pavements, Design of Flexible Pavement by CBR method, Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, Wet mix macadam (WMM), Granular Sub Base (GSB), Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Cement Concrete (CC) road construction.

**Railways Engineering :** Permanent Way and its Components, Type of rails, rail gauges, permanent way formation, coning of wheels, defect in rails, rail fastenings, fish plates, spikes, chairs, keys, bearing plates, sleepers, sleeper density, ballast, Track Geometrics, Turnouts and Crossings, Stations and Yards, Horizontal curves and super-elevation, transition curves, points and crossings, design of turnouts, types of crossings, stations and Yards, Signalling and Interlocking, Centralized train control system, ATS, principle types of interlocking, high speed track, airport planning & design, selection of site for an airport. Airports – layout and orientation, Runway and taxiway design consideration, geometric design, Zoning laws, traffic control, Runway lighting.

**Part – D**

**Environmental Engineering :** Population forecasting by various methods, Transmission of water, Storage and distribution of water, Physical, chemical and bacteriological examination of water and wastewater: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. quality requirements, standards of water and waste water. Water treatment: screening, sedimentation, determination of settling velocity, efficiency of ideal sedimentation tank, design of settling tanks, grit chamber. Primary sedimentation and coagulation, filtration: theory of filtration; hydraulics of filtration; slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters. Waste water treatment: unit operations, processes, Secondary and tertiary treatment, Anaerobic digestion of sludge, septic tank, up flow anaerobic sludge blanket (UASB).

**Part – E**

**Surveying :** Classification, Principles, distance, direction and elevation. Ranging, Meridians and Bearings, Methods of leveling, Booking, Reciprocal leveling, distance of visible horizon, Profile leveling and cross sectioning, Errors in leveling, plane table surveying, Contouring, Theodolite survey, Methods of horizontal and vertical control, Triangulation, Signals, Satellite station, corrections, Trigonometric leveling, simple circular curves, Transition curves – types, Vertical curves. Electronic Distance Measurement systems, Total Station – its advantages and applications, Global Positioning Systems Segments, working principle, errors, Geographic information system, Photogrammetry; basic principles, scale of a vertical photograph, relief displacement, relief displacement, flight planning, stereoscope and stereoscopy, parallax equations, Remote Sensing, Electromagnetic spectrum, atmospheric effects, image characteristics, Remote sensing systems, spectral signatures and characteristics, spectral reflectance curves, image classification, Applications of remote sensing to civil engineering.

**4. ELECTRONIC ENGINEERING**

**PAPER-I**

**1. Electronic Devices:** Energy bands in semiconductor, band-gap in direct and indirect semiconductors, P-N junction, Zener diode, clipping, clamping and rectifiers. Small signal equivalent circuits of diodes, working of BJT, JFET, MOSFET devices.

**2. Analog Circuits:** Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations. High frequency transistor models, frequency response of single stage and multistage amplifiers. Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.

**3. 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.

**4. Network Theory and Basic Machines:** DC Circuits-Ohm's & Kirchoff's 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.

**5. Digital Electronics:** Number representations: binary, integer and floating-point-numbers. Combinatorial circuits, Boolean algebra, minimization of functions using 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.

**6. 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, 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.

**7. Instrumentation:** Principles of measurement, accuracy, precision and standards; Analog and Digital systems for measurement, measuring instruments for different applications; Static/dynamic characteristics of measurement systems, errors, statistical analysis and curve fitting.

**8. Computer Organization and Architecture:** Basic architecture, CPU, I/O organisation, memory organisation, peripheral devices, trends; Hardware/software issues; Date representation & Programming; Operating systems-basics, processes, characteristics,

applications. Microprocessors & microcontrollers, basics, interrupts, DMA, instruction sets, interfacing; Controllers & uses; Embedded systems.

**PAPER-II**

**1. 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.

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

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

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

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

**6. Random signals and processes :** autocorrelation and power spectral density, properties of white noise, filtering of random signals.

**7. Information theory :** entropy, mutual information and channel capacity theorem, Huffman coding algebraic and convolutional coding.

**8. 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.

**5. CHEMICAL ENGINEERING**

**PAPER-I**

**(a) Fluid and Particle Dynamics**

Properties of fluids, concepts of compressible and incompressible flow, Laminar and turbulent flows, Equation of continuity and Navier-Stokes equation, Bernoulli's theorem, flow meters, fluid drag and pressure drop due to friction, Reynold's Number, friction factor and pipe roughness, pumps, jet ejectors, compressors, blowers, fans. Agitation and mixing of liquids/solids/pastes, screening, crushing, grinding, principles and equipments. Rittinger's, Kick's and Bond's laws, filtration and equipments. Free and hindered settling, concept of fluidization, transport of solids.

**(b) Mass Transfer**

Molecular diffusion, Fick's law of diffusion, mass transfer coefficients, film and penetration theories, distillation, relative volatility, fractional distillation, plate and packed columns of distillation, calculation of theoretical number of plates. Liquid-liquid extraction, absorption & stripping, drying, humidification, dehumidification, leaching, crystallization, adsorption isotherms.

**(c) Heat Transfer**

Conduction, thermal conductivity, extended surface heat transfer. Free and forced convection, heat transfer coefficients, Nusselt number, co-current and counter current flow, LMTD, fouling factor. Design of double pipe and shell & tube heat exchangers, analogy between heat and momentum transfer, boiling and condensation, single and multiple effect evaporators. Radiation, Stefan-Boltzmann Law, emissivity and absorptivity, calculation of heat transfer from a furnace, Solar heaters.

**(d) Advance Separation Processes**

Fundamentals of separation process, equilibrium separation processes, ion exchange, electro-dialysis, reverse osmosis, ultra-filtration, molecular distillation, super critical fluid extraction.

**(e) Process Equipment design**

Basic design Procedures and theory, factors affecting vessel design, cost considerations, design of storage and pressure vessels, design of flat and elliptical head, design of supports, characteristics and selection of materials of construction.

**(f) Process Dynamics Instrumentation and Control**

Measuring instruments for level, pressure, flow, temperature, pH and concentration. Control variables, manipulated variable and load variables. Laplace transforms, transfer functions of first and second order systems, Block diagram representation, controllers and their transfer functions, stability of closed loop system, Routh array test, transient and frequency response, Bode plots.

**PAPER-II**

**(a) Material and Energy Balance**

Gas law, material balance without chemical reactions, material balance with chemical reactions, recycle/bypass/purge calculations, combustion of solid/liquid/gaseous fuels, energy balance calculations, heat of reaction, adiabatic flame temperature.

**(b) Chemical Engineering Thermodynamics**

Laws of thermodynamics, PVT relationship for pure components and mixture, Maxwells relations, Fugacity, activity and chemical potential, vapor liquid equilibria for ideal/non-ideal, single and multicomponent systems. Criteria for chemical reaction equilibrium, equilibrium constant and equilibrium conversions, heat engines, heat pumps, refrigeration and related cycles.

**(c) Chemical Reaction Engineering**

Molecularity and order of reactions, theories of reaction mechanism, kinetics of homogeneous reactions and interpretation of kinetic data. Ideal flow reactors(batch, mixed, plug flow) and their performance equations, series and parallel reactions, multiple reactor system, temperature and pressure effects. Heterogeneous reactions, catalytic and non-catalytic reactions, gas-solid and gas-liquid reactions, effectiveness factor, non isothermal reactors and reactor stability.

**(d) Chemical Technology**

Wood based chemicals, pulp and paper, sugar industry, edible oils extraction, soaps and detergents, biogas, coal and coal chemical, petroleum refining, (Atmospheric distillation/cracking/reforming), polyethylene's (LDPE/HDPE/LLDPE), PVC, Polystyrene, ammonia manufacture, cement and lime industries, paints and varnishes, glass and ceramics, alcohol and antibiotics, nitrogenous and phosphatic fertilizers.

**(e) Environmental Pollution Monitoring & Control**

Safety, Ecology and Environment, Sources of pollutants in air water, Green house effect,

Ozone layer depletion, Acid rain. Micrometeorology and dispersion of pollutants in environment, water quality index (WQI), air quality index (AQI), measurement techniques of pollutant levels and their control strategies, solid wastes, their hazards and disposal techniques, Design and performance analysis of pollution control equipment, fire and explosion hazards, HAZOP and HAZAN, disaster management, environment protection acts.

**(f) Process Engineering Economics**

Fixed and working capital, cost estimation and comparison of alternatives. Net present value, pay back analysis. IRR, depreciation, taxes and insurance, break even point, PERT and CPM, profit and loss account, balance sheet and financial statement. Plant location and plant layout including piping.

**6. COMPUTER SCIENCE**

**PAPER-I**

**1. Computer Organization and Architecture:** Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes. Arithmetic and Logic Unit, Control Unit, Memory, Input/output devices, interfaces and ports, Interrupts and exceptions. Modes of Data Transfer, Synchronous & asynchronous communication, standard communication interfaces.

**2. Data Structures:** Elementary Data Organization, Built in Data Types in C / C++/JAVA. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT), Arrays and Application of arrays, parse Matrices and their representations. Linked lists, Stacks, Queues, Searching and sorting, Graphs, Tree, Binary Tree and its applications, Hashing, B+ tree.

**3. Discrete Structures & Theory of Logic:** Set Theory, Relations, Functions, Natural Numbers, Proof Methods, Proof by counter – example, Proof by contradiction. Algebraic Structures, Lattices, Propositional Logic, Trees, Graphs, Combinatorics.

**4. Database Management Systems:** Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship and enhanced E-R, Relational data Model and Language, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. SQL, Data Base Design & Normalization, NoSQL, Transaction Processing, Concurrency Control Techniques, Web Interface to DBMS, OO database, Case Studies of commercial DBMS.

**5. Design and Analysis of Algorithm:** Algorithms and its analysis, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics, Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List, Divide and Conquer with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. Greedy Methods: Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths – Dijkstra's and Bellman Ford Algorithms, Dynamic Programming such as Knapsack. All Pair Shortest Paths – Warshall's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound techniques such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets. Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms.

**6. COMPUTER NETWORKS:** Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design, Physical Layer Transmission Media. Switching methods, ISDN, Terminal Handling, Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling. Network Layer - Point - to Point Networks, routing, Congestion control Internet working -TCP / IP, IP packet, IP address, IPv6. Transport Layer - Design issues, connection management, Session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management. Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Internet and Public Networks, Peer to Peer Network.

**7. Principles of Programming Languages, Role of Programming Languages, Programming Paradigms, Programming Environments, Language Description:** Syntactic Structure, Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models, Data Types, and Basic Statements, Binding, Type Checking, Scope, Scope Rules, Lifetime and Garbage Collection, Primitive Data Types, Strings, Array Types, Associative Arrays ,Record Types, Union Types, Pointers and References , Arithmetic Expressions , Overloaded Operators, Type Conversions , Relational and Boolean Expressions, Assignment Statements, Mixed Mode Assignments, Control Structures, Selection ,Iterations, Branching, Guarded Statements, Subprograms and Implementations, Design Issues for Functions , Semantics of Call and Return, Implementing Simple Subprograms, Stack and Dynamic Local Variables, Nested Subprograms, Dynamic Scoping. Object-Oriented, Concurrency and Event Handling, Object Oriented Programming using C++ and Java, Functional and Logic Programming Languages.

**8. SOFTWARE PROJECT MANAGEMENT:** Fundamentals of Software Project Management (SPM), Software Project Planning, Software Project Estimation, Project Organization and Scheduling Project Elements, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project Schedule, Scheduling Objectives, Building the Project Schedule, Scheduling Terminology and Techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts, Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Software Quality Assurance and Testing, Project Management and Project Management Tools, Software Configuration Management, Risk Management, Cost Benefit Analysis, SPM Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

**9. CYBER SECURITY:** Information Systems, its types and development, Information Security and its Need, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis. Application Security: Database, E-mail and Internet, Data Security Considerations: Backups, Archival Storage and Disposal of Data, Security Technology: Firewall and VPNs, Intrusion Detection, Access Control. Security Threats - Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-

Commerce- Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Public Key Cryptography, Developing Secure Information Systems, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and Intrusion Detection Systems, Backup Security Measures. Security Policies: Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Evolving Technology Security – Mobile, Cloud, Outsourcing, SCM, Information Security Standards: ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India, IT Act 2000 Provisions, Intellectual Property Law, Software License, Semiconductor Law and Patent Law. Corporate Security

**PAPER-II**

**1. OPERATING SYSTEMS:** Operating System definition, function and services, Types and features, Operating System Structure- Layered structure, System Components, Reentrant Kernels, Monolithic and Microkernel Systems, System Calls types, System Programs, Process and Thread: process states, process control block, Inter process communication; Process Synchronization: Classical problems of synchronization, Concurrent Processes CPU Scheduling Criteria and Algorithms, Memory Management, File management, Device Management and Disk scheduling, File Management, UNIX Commands and utilities, Linux: System components, Process management, scheduling, memory management, Networking software layers, Security, various editors, I/O devices, IPC.

**2. COMPUTER GRAPHICS:** Types of computer graphics, Graphic Displays, Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines drawing algorithms, Circle generating algorithms and parallel version of these algorithms, Basic and Composite Transformations, Reflections and shearing. Windowing and Clipping, 3-D Geometric Primitives, representation, Transformation, projections and Clipping, Curves and Surfaces, Hidden Lines and Surfaces

**3. ARTIFICIAL INTELLIGENCE:** Introduction, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing, strategies, Informed search strategies and algorithms, Knowledge Representation & Reasoning, Machine Learning , Pattern Recognition.

**4. COMPILER DESIGN:** Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analysis, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG, Parsing Techniques, Syntax-directed Translation, Symbol Tables, Run-Time Administration, Error Detection & Recovery, Code Generation and Code optimization.

**5. SOFTWARE ENGINEERING:** Introduction, Software life-cycle models, Software requirements, Requirements Specification, Software design and Software user interface design, Coding Issues, Software integration and testing, Software support processes and Quality Assurance, IEEE Software Engineering Standards , Software maintenance, Software reuse, SOFTWARE TESTING & AUDIT.

**6. DISTRIBUTED SYSTEM:** Characterization of Distributed Systems, Theoretical Foundation for Distributed System, Distributed Mutual Exclusion, Distributed Deadlock Detection, Agreement Protocols, Distributed Resource Management, Failure Recovery in Distributed Systems, Transactions and Concurrency.

**7. WEB TECHNOLOGIES:** Introduction and Web Development Strategies, Protocols Governing Web, Writing Web Projects, Internet services and tools, Client-server computing. Core Java, Web Page Designing, XML, DOM and SAX, Dynamic HTML, Scripting, Networking, Enterprise Java Bean, Java Database Connectivity (JDBC), Merging Data from Multiple Tables, Servlets, Handling HTTP get and post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session, Java Server Pages (JSP)

**8. IMAGE PROCESSING: DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT. IMAGE ENHANCEMENT: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement. IMAGE RESTORATION: Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering. IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm. IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

**9. SOFT COMPUTING:** Neural Networks, Fuzzy Logic and Genetic Algorithm(GA)

**10. HIGH PERFORMANCE COMPUTING:** Grid Computing, Cluster Computing, Beowulf Cluster, Cloud Computing.

**7. PAINT TECHNOLOGY**

**PAPER-I**

**(a) Introduction to Surface Coatings and their Components**

Surface coatings , Essential mineral and fixed oils, Modification of oils, Coating driers, Volatile solvents and other components, Safety, Health and environmental aspects.

**(b) Material and Energy Balance in Paint technology**

Gas law, Material balance without chemical reactions, Material balance with chemical reactions, recycle/bypass/purge calculations, Energy balance calculations, Heat of reaction.

**(c) Fluid Flow Solid handling, Instrumentation and Control in Paint technology**

Properties of fluids, Newtonian and Non-Newtonian fluids , Laminar and turbulent flows, Equation of continuity, Bernoulli's theorem, Free and hindered settling Flow meters, Pressure drop due to friction, Reynold's Number, Friction factor and pipe roughness, Pumps, Agitation and mixing, Free and hindered settling, Measuring instruments for level, pressure, flow, temperature, concentration. Laplace transforms, Transfer functions of first

and second order systems, Block diagram representation, Controllers and their transfer functions.

**(d) Technology of Inorganic Pigments and Extenders**

Pigmentary properties, Inorganic prime pigments, Extender pigments, White and black pigments, Colour pigments.

**(e) Technology of natural resins, alkyds and polyesters**

Natural resins and their modification, Natural polymers and their modification, Introduction to synthetic polymers, Alkyd resins, Hydrocarbon and other resins.

**(f) Technology of synthetic resins and polymers**

Formaldehyde resins, Epoxy resins, Polyurethane resins, Silicone resins, Ethylene resins.

**(g) Technology of organic functional and effect pigments**

Colour phenomena, Industrial organic pigments, Classical AZO pigments, Metallic, functional and effect pigments, High performance and composite effect pigments.

**PAPER-II**

**(a) Heat and Mass transfer in Paint Technology**

Fundamental laws of conduction, convection and radiation, Co-current and counter current operations, Log mean temperature difference (LMTD), Different heat exchangers and their calculations, Molecular diffusion, Fick's law of diffusion, Mass transfer coefficients, Basics of distillation and extraction, Humidification and dehumidification.

**(b) Characterization, Analysis and Evaluation of Coatings**

Analysis of coatings and classification of their properties, Optical properties of coatings and complete application in colour development, Quality control, Physical, chemical and mechanical properties of coatings, Weather resistance and ageing properties of coatings.

**(c) Technology of Formulation and Manufacture of Coatings**

Coating additives and principles of coating formulation, Principles of coating manufacture, Heavy duty machines and ball mills, Attritors and high speed machines, Production planning, Factory lay-out, Safety health & environment, Computers and modeling in paint resin formulation.

**(d) Technology of Surface Preparation, Treatments and Coating Application**

Methods and equipments of surface preparation, Pretreatment and conversion coating, Coating application and electro-deposition, Curing of film, Effluent treatment, Waste management, Paint shop services, Paint defect and paint remover, Different paint additives and their role in paint technology, Packaging in paint technology.

**(e) Technology of Printing Inks**

Printing process and nature of printing inks, Raw materials for printing inks, Testing and evaluation, Different types of inks for diverse industrial applications, Mixing and milling equipments, handling and storage.

**(f) Technology of Industrial, automotive and specialty coatings**

Clear finishes, primers and marine coatings, Appliance and heavy duty coatings, Novelty finishes, fire retardant coating, Automotive protection products Finishing and refinishing, Electro-deposition coatings, UV curable coatings, Powder and specialty coating.

**(g) Technology of Architectural and Eco friendly coatings**

Introduction to eco system, Architectural aspect of eco-friendly coatings, Architectural coating systems, Eco-friendly coating. Corrosion and its control in paint technology.

**8. PLASTIC MOULD TECHNOLOGY**

**PAPER-I**

**(a) Fundamentals of Polymer Science**

Classification of polymers, types of polymerization, degree of polymerization, glass transition temperature, morphology of polymers.

**(b) Chemistry and Thermodynamics of Polymers**

Monomers, monomer reactivity ratio and its significance, kinetics of polymerization, stereochemistry of polymers, block and graft co-polymers, laws of thermodynamics, open and close systems, thermodynamics of melting and polymers, thermodynamics of glass transition, thermodynamics of polymer solutions.

**(c) Plastic Materials and Processing**

Sources and manufacture of plastic raw materials, oefin polymers, vinyl chloride polymers, PMMA, polystyrene, cellulose polymers, epoxy plastics, polyurethane, silicones, extrusion, types of extruders, compression and transfer molding and its applications, calendaring and milling.

**(d) Polymerization Engineering**

Industrial methods of polymerization, types of polymer production processes and reactors, utility of catalysts in polymerization.

**(e) Mould and Die Manufacturing**

Types and applications of mould making, electrical discharge machining (EDM), Electroforming for mould manufacturing, heat treatment processes, various types of furnaces, hobbing for mould making, polishing technology in mould making, advantages and disadvantages of automation.

**(f) Plastic Packaging Technology**

Selection criteria for packaging materials, conversion process for packaging materials, process for flexible/rigid packaging, testing of plastic packaging.

**PAPER-II**

**(a) Additives and Compounding**

Evaluation and functions of additives, selection criteria, fillers, stabilizers, pigments, antioxidants, metal deactivators, thermal stabilizers, UV stabilizers, impact modifiers, colourants, fire retardants, coupling and blowing agents, plasticizers, applications of additives, estimation of additives.

**(b) Polymer Composites**

Introduction to composite materials, theory of composite materials, compounding of thermo plastics, fiber reinforced plastic (FRP) processing.

**(c) Characterization of Polymeric Materials**

Molecular characterization of polymers, thermal analysis techniques, x-ray diffractometry, principles of microscopy, UV-visible spectroscopy, FTIR spectroscopy, Gas chromatograph (GC), mass spectrometer, nuclear magnetic resonance spectroscopy (NMR).

**(d) Polymer degradation and plastic waste management**

Thermal degradation, mechanical and ultrasonic degradation, photo degradation, degradation by high energy radiation, biodegradation, plastic waste generation and separation techniques, processing of plastic waste, recycling of thermoplastics and thermosets.

**(e) Rheology of Polymers**

Properties of fluids, Newtonian and Non-newtonian fluids, shear stress and strain, viscoelasticity, rheometers and viscometers, rheology of polymeric liquids, rheology in polymer processing operations.

**(f) Diverse Applications of Polymers**

Structural and semi structural applications, biomedical application, specialty polymers, conducting polymers, polymer nanomaterials.

**9. TEXTILE TECHNOLOGY**

**PAPER-I**

**1. Textile Fibre-I:** Textiles fibres & their classification, general properties of fibres, cultivation/production, structure & properties of cotton, jute, linen, wool, silk, & other natural fibres, identification of fibres by different methods, molecular weight & its determination, concept of orientation & crystallinity, concept of Tg & Tm & its determination, high performance fibres, high strength high modulus fibre, aramid fibres, carbon fibres, thermal & chemical resistant fibres, elastomeric fibres, biodegradable fibres, their manufacture, properties & application.

**2. Yarn manufacture-I:** Sequence of cotton & its blends, ginning of cotton, objects of opening & cleaning, role of blow room machines & their principle of operation, carding: Objects, functions & working principle & process parameters of cotton card, woolen & worsted cards, Objects, principles & process parameters of draw frame for cotton & its blends, process sequence of combing, principle of combing, calculations related to blow room, card, draw frame, & comb, objectives, functions & working of gill boxes, calculations pertaining to blow room, card, draw frame, comb & gill box. Role & function of autoleveller in card & draw frame, types of defects & remedies during blow room, carding & draw frame.

**3. Fabric Manufacture-I:** Objects of preparatory process, different types of winding machines & their working principles, objects of warping, different types of warping machines & their principles of operation, objects of sizing, sizing ingredient, different types of sizing machines & their working, defects in winding, warping & sizing & their remedies, calculations pertaining to winding, warping, sizing & beaming, weft knitting machines, different types of weft knitted structures & machines, basic warp knitted structure, underlap & overlap, principles of Tricot, & Rachel machines, calculation pertaining to weft & warp knitting, process control in knitting.

**4. Chemical processing-I:** Objective, singeing techniques, their merits and demerits, Desizing: objectives & mechanism of desizing, desizing evaluation, scouring of natural, manmade and blended textiles, Evaluation of scouring efficiency, carbonisation of wool, degumming of silk, bleaching of cotton, silk, wool, man-made fibres and blended textiles, estimation of bleaching, objectives, concepts of mercerization, concept of color, additive, Application of direct, reactive, vat, solubilized vat and sulphur dyes on cellulose fibres, application of acid, basic and metal complex dyes on wool and silk. auxiliaries used in dyeing.

**5. Textile Testing-I:** Objective of testing & sample size, methods & principles involved in testing of fibre properties, like moisture, length, fineness, tensile strength, maturity, yarn testing : count, strength, tenacity, unevenness, hairiness, principle involved in testing of various fibre & yarn properties.

**6. Technical textiles:** Types of technical textiles, textiles for filtration, protective textiles, medical textiles, smart textiles, geo textiles building material etc.

**PAPER-II**

**1. Textile Fibre-II:** Textile Fibre-II: Regenerated & synthetic fibres, concept of polymerization & manufacturing process of regenerated & synthetic fibres by melt, dry, wet & dry-jet wet spinning methods, structure & properties of regenerated & synthetic fibres & their uses, concept of as spun, POY & FOY, objectives & principles of different methods of texturing & process parameters involved in texturing, concept of drawing & heat setting & process parameter of drawing & heat setting.

**2. Yarn manufacture-II:** Principles & process parameters of speed frame & rubbing frame, objectives & working of ring frame, & mechanism involved in drafting, twisting & winding at speed frame & ring frame, Spinning of long staple fibres like jute, wool, & silk etc, Objects of doubling, types of doubling systems, Calculations pertaining to speed frame, ring frame & doubling & TFO. & new spinning systems, principle involved in rotor spinning, principle of operation of DREF-II & DREF-III machines, principle & mechanism of air-jet, air vortex, ply-fil, wrap, electrostatic spinning, textured yarn manufacture. Idealized helical geometry, packing of fibres in a yarn, fibre migration.

**3. Fabric Manufacture-II:** Different methods of fabric manufacturing- woven, knitted & non-woven, Types of shuttle loom & their mechanism, role & working of tappet, dobby & jacquard & their developments, picking, beat-up, let off & take up mechanism in loom, role & working of various stop motions, features of automatic shuttle looms, different types of shuttleless loom viz: air-jet, water-jet, rapier, projectile & their principle & mechanism, elements of fabric geometry, Classification of non-woven fabrics, principles of web formation, web characteristics and their influence on properties, bonding techniques, needle punching, spun bonding techniques, application of different types of non woven structures.

**4. Fabric Structure & design:** Basic elements of fabric design, plain, twill, sateen, huck-a-back, weaves their derivatives construction, objectives of extra warp & weft design, warp backed & weft backed design, different types of double cloth construction, geometrical & floral design, damask & brocade design, tapestry structure, basis of carpet & textile design, Indian Motif, Historical, aesthetical, traditional textile, Jamdani, Bandhani, Batik prints, digital printing, screen printing, block printing, colour forecasting of carpet & textile Design, computer aided design & its importance. Fabric geometry, square & jammed structure, fabric deformation under stress.

**5. Chemical processing-II:** Dyeing of polyester with disperse dye, nylon with acid dye, acrylic with cationic dyes, methods of dyeing blends, characteristics of printing paste ingredients, classification and mechanism of thickeners, printing methods, styles of printing, printing after treatments, objects & types of finishing, mechanical finishing, chemical & functional finish, mechanism, flame retardant finishes, water repellent finishes etc.

**6. Textile Testing-II:** Fabric testing: gsm, thickness, cover, air permeability, moisture & water transmission, wetting & wicking properties, compressibility, tensile, tear & bursting strength, abrasion & pilling resistance, FAST & KESF properties etc.

**10. FOOTWEAR TECHNOLOGY**

**PAPER-I**

**UNIT-I**

**INTRODUCTION TO LEATHER TECHNOLOGY**

Various fibrous and non fibrous proteins, Non proteinous skin components. General physical and chemistry of proteins. Chemical constitution of hides and skins. Reaction of proteins with acids, bases and salts.

Primary structure of collagen, effect of enzymes on collagen.

Keratin, Reticulin, Elastin, histology of hides and skins-cell, tissue, fibers, muscles, glands, epidermics, pretanning process-soaking, liming, deliming, bating, degreasing, pickling & depickling.

Concept of tanning and leather, leather properties dependent on tanning, Vegetable tannins and vegetable tanning, classification of vegetable tannins, vegetable tanning materials and their properties, hydrolysable and condensed tannins, Mechanism of

<p>vegetable tanning, process of vegetable tanning, synthetic tannins, chrome complexes and their structures, method of chrome tanning, preparation of chrome liquors &amp; Powders, mechanism of chrome tanning. Study of Aluminum, Zirconium, Iron, Titanium, Sodium silicate &amp; Polyphosphates. Theory of neutralization, Combination tannages.</p> <p>Principle of color chemistry, classification of leather dyes, color matching, theory and mechanism of dyeing, oils, fats, classification and types of leather finishes, pigments, binders, intro cellulose lacquers, wax emulsions, silicon emulsion.</p> <p>Tannery effluents, effluent disposal, leather machinery-different machine used in leather processing, Anatomy of human foot, closing, making of footwear, classification of leather goods, method and material for construction.</p> <p><b>UNIT-II</b>  <b>TESTING AND QUALITY CONTROL</b>  <b>Chemical analysis of pelts and Leathers:</b> Principles and methods of analysis of limed and pickled pelt, chemical testing of vegetable tanned/chrome tanned/aluminum tanned/zirconium tanned/ formaldehyde tanned, combination tanned leathers.  <b>Physical Testing of Leather:</b> Sampling position for physical testing of leather. Different methods employ for physical testing of leather.  Principle involved in Static and Dynamic methods of non destructive testing of leathers. Different methods in testing of colour fastness of leathers.  <b>Standards and quality Control:</b> Quality control in leather processing, Rectification of defects in hides, Skin and Leathers, control of yield, color and finish of leather etc. Physical and chemical characteristics (standard specifications) of various types of leathers.  <b>Analysis of Footwear and Leather Product.</b></p> <p><b>UNIT-III</b>  <b>LEATHER PRODUCTS TECHNOLOGY</b>  <b>Overview:</b> Classification of leather Goods &amp; Garments. Selection of materials Grading and assorting of Leathers for Leather Goods &amp; Garments. Property Requirement for Leather and Lining materials, Accessories for leather Goods and garments.  <b>Cutting:</b> Hand and Machine Cutting, Pattern interlocking, various types of assembly Techniques, skiving, splitting, folding, Sewing Quality Control measures in Leather products manufacture.  Machinery needs for Leather Goods Manufacture, Various types of Sewing machines-Flat Bed, Post Bed, Clicking, Splitting, Skiving, folding, embossing.  General information about Sports Goods, Harness &amp; Saddlery Industry. Classification of Leather Based Sports Goods like Football, Hockey Ball, Cricket Ball, Sports Gloves, Wicket keeping Gloves, Sports Goods Bags.  Harness and Saddlery such as jumping, riding, racing, reins, Halters, Bridles Stirrups, Noseband, Martingales. Special types of leathers manufactured for sports goods, Harness and Saddlery and their Characteristics.  <b>Organisation &amp; Management:</b> Project feasibility Reports, costing and pricing for leather goods &amp; garments. Total Quality management. Analysis of International market trends.</p> <p><b>UNIT-IV</b>  <b>MATERIAL OF FOOTWEAR MANUFACTURE</b>  <b>1. LEATHER:</b> Upper material (Natural and Man made) Different types of leather, used in shoe manufacturing, their characteristics and properties.  <b>2. FABRIC:</b> Classification, fabrics used for upper lining, side lining, backer, taping, Socking, toe puff and their characteristics, use of elastic in footwear.  <b>3. RUBBER:</b> (Soling Material/Sole) Utility of rubber in shoe industry and types of rubber used in footwear and their identification, characteristics, rubber sole, crepe sole, moulded rubber sole microcellulor, rubber sole, synthetic and resin rubber soles, Rubber compounding, mixing and vulcanization. Polymers.  <b>4. FIBRE BOARD:</b> Different types of fiber board, Classification of leather board, characteristics of different types of leather boards for insole, stiffener toe puff and heel. Utility and use of paperboard; different types of paper board. Insole and types of materials.  <b>5. SYNTHETIC MATERIAL:</b> PVC,PU,TPR poromerics, EVA and Filon materials, their properties and uses.  <b>6. WOOD AND METAL:</b> Wooden and metallic heels, platform logs and shanks : Types of wood and metal used and their characteristics.  <b>7. ADHESIVES:</b> Types of adhesives, basic materials used in formulation of adhesives like starch glue, latex, rubber solution, chloroprene based adhesive polyurethane, reoprene etc. Bonding strength of adhesives, time of setting comparative study of adhesives available in the market. Selection of adhesives for cemented construction.  <b>8. GRINDERIES, SOLE AND SOLING MATERIALS:</b> Eyelets, rivets, hob nails of different heads, pinel pins, tingles made of different metals like iron, brass and their suitability and longevity. Special type of rivets used in selective type of footwear, brass screw, brass and steel staple and their use in footwear spikes used in sport shoes, shank, still toe cap and their use in special type of footwear, bottom - filling, materials like cement, elastics laces, EVA, Cork sheet, Saw Dust leather waste. Padding materials decorative fittings for footwear, different types of threads used in footwear manufacturing, Types of Niddles.  <b>9. FINISHING MATERIALS:</b> Creams and waxes of different varieties and their use in formulation of finishing materials like sole polish, heel hand ball, upper dressings, polishes and creams of different colours. Glazing materials, lacquers, binders, resins, plasticizers etc. Material used in the formulation of glazing material such as rosin, sundras, shellac and the solvents required for their preparation.</p> <p><b>UNIT-V</b>  <b>FUNDAMENTAL OF FOOTWEAR TECHNOLOGY AND FOOTWEAR DESGN</b>  <b>FOOTWEAR MATERIALS AND COMPONENTS:</b> Different types of upper and lining leathers; Different types of soling materials; Different types of adhesives used in footwear industry; Kinds of insole boards, Grinders; Fasteners; Shoe dressing materials etc.  <b>DESIGN AND PATTERN DEVELOPMENT:</b> History of shoe; Purposes and styles; Fashion &amp; designs; Preparation of standards and section for men, ladies &amp; children; Classic and other types of shoes and boots.  <b>CUTTING, PRE-CLOSING AND CLOSING:</b> Principles of cutting – Hand, machine; Clicking room design and management. Checking incoming work, stitch making, skiving, punching and gimping, heat embossing, flow moulding, toe puff attachment, attaching linings and scrims, trimming linings, finishing off closed seams. Top line and other edge treatments, local reinforcements, attaching fasteners and trims  <b>PRELASTING AND LASTING:</b> Principles and methods of pre-lasting and lasting for different types of construction; Sole attaching; Lasted margin; Upper preparation; Sole preparation; Sole cementing; Upper 76 cementing; Bottom fillers and shanks; Adhesive drying, Heat activation, Spotting, Pressing, Last slipping, Health and safety, Quality control and fault finding problems- solving.  <b>METHODS OF SHOE CONSTRUCTION:</b> Various methods of shoe construction; shoe room techniques.  <b>ANATOMY OF HUMAN FOOT:</b> Bones, Joints, Arches, Ligaments, Skin.  <b>FOOT DISEASES AND ABNORMALITIES.</b></p>	<p><b>FOOT MEASUREMENT AND INTERNATIONAL SIZE SYSTEM.</b>  <b>LAST.</b>  <b>PAPER-II</b>  <b>UNIT-I</b>  <b>SELECTION OF SITE, FOOTWEAR AND LEATHER GOODS MACHINERY</b>  <b>1. Selection of Site:</b> Location of footwear and leather goods manufacturing units. Factors influencing site selection such as availability of power, transport, market, labour, raw materials.  <b>2. Footwear and Leather Goods Machinery:</b> General construction, descriptive idea of various footwear and leather goods machinery such as  (a) Pattern making machine  (b) Hand press  (c) Upper and bottom clicking press(Hydraulic/Pneumatic)  (d) Belt cutting machine  (e) Upper and bottom splitting machine  (f) Skiving machine  (g) Folding machine  (h) Industrial sewing machine (flat bed, cylinder bed, post bed, heavy duty, zigzag)  (i) Punching and eyeleting machine  (j) Trade mark embossing machine  (k) Fore part lasting m/c  (l) Side lasting machine  (m) Seat lasting veldschoen  (n) Upper roughing machine  (o) Bottom roughing machine  (p) Cementing press  (q) Pounding machine  (r) Sole screwing machine  (s) Sole &amp; heel trimming machine  (t) Combined finishing machine  (u) Spray booth with compressor  (v) Heel attaching machine  (w) Double operating Press (D.O.P. machine)  (x) Double needle stitching machine  (y) Lasting machine (To &amp; side lasting machine)  (z) Sole Press M/c (Hydraulic/Pneumatic), Heat Setter and Chiller</p> <p><b>3. Footwear Plant Maintenance:</b>  (a) Functions of maintenance department  (b) Maintenance procedures - preventive maintenance, Routine maintenance and breakdown maintenance of footwear and Leather goods machineries and accessories.  (c) Lubrication and oiling procedures in routine maintenance and development lubrication charts.  (d) Fabrication and repair of components for breakdown maintenance.  (e) Estimating the repair and maintenance cost.  (f) Safety - Definition, importance, causes of accident, accident prevention rules, general safety devices.  4. Selection of machinery for different capacities of production, conveyor system of working in upper making and assembly.</p> <p><b>UNIT-II</b>  <b>CONCEPT OF FOOTWEAR TECHNOLOGY</b>  <b>1.</b> A historical review of the footwear industry and its impact and importance in modern life particularly in relation to all type of gents, ladies and children shoes of every day use. Modern trends and development in foreign countries. Purpose of shoes in every day life.  <b>2.</b> Machines and tools employed in the upper and bottom clicking departments.  <b>3.Various stages of footwear manufacture as:</b> Upper clicking : Principles of clicking, marking and cutting of paper patterns and leather components of shapes, design tightness strength, uniformity, economy and control of material consumption. Condition of knife, way of cutting, planning of cutting arrangements, inter-locking locking continuity when cutting, over cutting, identification, marking and correct pairing. Cutting of fabrics by different system i.e. wrap system, welt system and bias system of cutting and lining marking. Advantages and disadvantages of Hand and press clicking. Qualities of a good clicker.  <b>4.</b> Introduction to constructions such as Good year welted, silhou welt Lock stitch through sewn welt, fair-stitched, moccasin machine sewn (Black or Mekay) cemented riveted screw and stitched, turnshoe, veldschoen, slipstated, direct moulded construction, injection moulding; DVP, DMS. Strobel construction, Machine strobel construction, Stitch down constant.  <b>5.</b> Bottom cutting and preparation of bottom stock Correct placing of cutting knives in accordance with their requirements, quality and thickness of the components for maximum economy, characteristics of different bottom components used. Important point to be considered while cutting the bottom components, systematic cutting of different components from the appropriate portions of sole leather sides. Preparation of bottom stock and the importance of correct preparation of bottom components. Sorting, splitting, insole preparation for welted shoes. Preparation of the toe puffs/stiffeners, tampering of bottom components and its effect on manufacturing processes. Leather unit soles (PVC coated)  <b>6.</b> Stamping and marking of cut components.  <b>7.</b> Economical methods of clicking and reduction in wastage.  <b>8.</b> Methods of estimating quantity of raw material required for upper lining and bottom component and calculation of upper cost.</p> <p><b>UNIT-III</b>  <b>UPPER CLOSING AND FINISHING OPERATIONS</b>  <b>Upper closing:</b> Checking of pairs and identification marks before commencing major operation in closing department.  <b>Punching:</b> To start the closing of components, decoration and punching.  <b>Skiving:</b> Close seam skive, under lay skive and turning in skive. Purpose and importance of skiving by hand and machine, their merits and demerits.  <b>Edge treatment:</b> Purpose and affects of edge treatment. Types of edge treatment. Raw-edge, burnished edge, folded edge, bound edge, gimped edge, slipbeaded edge and bagged edge.  <b>Ornamentation and its purpose:</b> Kinds of ornamentation - Fancy seam, multi seam, Braiding, corded seam. Ornamental lacing, stitching along edges. Embroidering and performing.  <b>Reinforcements:</b> Taping, backing, staying and stay stitching. Their purpose, importance and effects.</p>
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<p>Joining of upper and lining section for upper closing :</p> <p>Different kinds of seam plain close seam, silked or open stitched seam, lapped seam use and importance in shoe upper closing. Types of stitches-lock, chain, and zigzag stitch. Difference in seam and stitch. Threads used in closing room.</p> <p><b>Finishing operations:</b> Cleaning, Edge beating, trimming, eyeletting and checking the quality of closed uppers, description and sequence of operations of upper closing of court shoe, Mocassin shoe.</p> <p>Durby shoe and Oxford shoe. Machines and tools and devices employed in the upper closing department.</p> <p><b>UNIT-IV</b></p> <p><b>LASTING, MAKING AND FINISHING OF LEATHER PRODUCT</b></p> <p><b>Lasting and Making:</b> Preparation of awl. Types of stitches required for various purposes. Relation of awl stitches and threads to material and size of stitches. Principles of drafting and its importance in lasting of shoes of different constructions (Welled, veldt shoes) welt attaching by hand and machine (staples shank fitting, bottom filling, sole attaching by hand and machine, bottom leveling, sole nailing.)</p> <p><b>Modern methods of footwear construction including direct moulded, injection moulded and cemented unit sole:</b> Purpose and relative merits of the various methods of footwear construction in relation to their use. Importance of conditioning, damping, mulling, heat setting and drying. Detailed study of cemented shoe construction. Adhesives and machines used in cemented construction.</p> <p><b>Finishing:</b> Upper leather dressing, cleaning and shoe lacing, Heel attaching and top piece attaching by hand and machine. Different types of edge trimming, fore part and waste trimming, heel scouring, heel front buffing, inking, edge setting by hand and machine, bottom buffing, bottom finishing, upper leather cleaning and dressing, fitting and sock, shoe lacing, checking and packing for different types of footwear.</p> <p>The aims and objects of finishing, their utility. The relation between heel pairing and heel scouring, edge trimming and setting, common faults in finishing.</p> <p>Inspection recognition and elimination of faults. The use of heat and heat effects in shoe processes. Various tools, equipments and machinery employed for finishing. There use and general maintenance. The vital parts of machines and their minor adjustments.</p> <p>Material used for packing, individual and trend ship packing. Export packing, use of fungicides for export packing. Defect removing methods- such as wrinkles on lining twisted back strap, High and low quarters, Soft toe and back, soft stiffener etc.</p> <p><b>UNIT-V</b></p> <p><b>COMPUTER AIDED LEATHER PRODUCT DESIGN</b></p> <p>Anatomy of human foot, Function of the foot, Foot comfort and Common foot abnormalities, Foot and Last measurement, Shoe sizing system and fittings. Designing and pattern making, Different types of footwear, Various components of footwear, Basics concepts of design and pattern cutting, Grading methods, Various allowances, Applications of computer aid designing, Materials of leather products- Selection of leather and non-leather materials for different components of footwear and garments. Basic methods of cutting different components, Tools and equipment for clicking, marking, skiving, edge Treatments, fitting, stitching and types of stitches, closing of simple uppers.</p> <p>Different method of footwear construction, Cemented, Direct vulcanized, Injection-moulded, Veldtschoen, Machine welled, Slip and sting Lasted, Finishing and Trimming operation, Classification of Leather goods, Type and selection of materials, Methods of construction, Tools and Machinery. Classification of leather, Material selection criteria for leather garments. Lining materials, Factors such as light weight, Porosity, Water absorption, Accessories metal fittings for garments, Designing methods, Various components, Preparation of Standards &amp; pattern of Garment/Material.</p> <p>Computer aided design, CAD, CPU, Data storage, Input/output devices, Function of CPU, Main memory and backup storage devices, Selection of Input/output devices, Operating system, Application of software for Footwear.</p> <p><b>11. TEXTILE CHEMISTRY</b></p> <p><b>PAPER-I</b></p> <p><b>1. Fibres-I:</b> Textiles fibres &amp; their classification, general properties of fibres, cultivation/production, structure &amp; properties of cotton, jute, linen, wool, silk, &amp; other natural fibres, identification of fibres by different methods, molecular weight &amp; its determination, concept of orientation &amp; crystallinity, concept of Tg &amp; Tm &amp; its determination.</p> <p><b>2. Principal of Yarn and Fabric Manufacture:-</b> Objectives of ginning, mixing &amp; carding process, drafts (actual &amp; mechanical) and draft constant, quality of web and neps etc., Objectives of Draw frame, passage of material on modern draw frame machine, Concept of draft, Comber, speed frame, ring frame, drafting twisting and winding on ring frame, double apron drafting system on ring frame, warping process, winding process, brief description of modern sizing machine, Passage of material on handloom and power loom, Comparison between shuttle and shuttleless looms.</p> <p><b>3. Testing:</b> Objective of testing &amp; sample size, methods &amp; principles involved in testing of fibre properties, like moisture, length, fineness, tensile strength, maturity, yarn testing : count, strength, tenacity, unevenness, hairiness, principle involved in testing of various fibre &amp; yarn properties.</p> <p><b>4. Preparatory process of Textiles:-</b> Natural and added impurities in grey fabric, singeing-its object and various types of singeing, introduction to various preparatory processes for cotton, wool, silk, nylon, polyester, acrylic and their blends. wool: scouring, decatizing, desizing- its objects, various desizing methods with its advantages &amp; disadvantages, scouring of cotton fabric: conventional and bio-scouring, Kiers – various types of kiers and their working. Objectives of bleaching, various types of bleaching agent such as NaOCl, CaOCl<sub>2</sub> and H<sub>2</sub>O<sub>2</sub>, NaClO<sub>2</sub>. Bleaching chemistry and mechanism, batch wise, semi continuous and continuous bleaching processes: J-box, Continuous bleaching range (CBR). methods used for determination of degradation of cotton during scouring and bleaching such as copper no., methylene blue absorption method, cuprammonium fluidity etc. optical whitening agent and their applications. objectives of mercerization, physical and chemical changes in cotton due to mercerization, various methods of determination of efficiency of mercerization.</p> <p><b>5. Technology of Dyeing:-</b> Classification of dyes according to the methods of application, general theory of dyeing, various method of dyeing- Batch, Semi continuous, Continuous dyeing. dyeing of cellulosic fibres with direct dyes, reactive dyes., vat dyes, solubilised vat dyes, sulphur dye, dyeing of protein fibres – silk and wool with different types of acid dyes –its advantages and limitations, metal complex dyes- 1:1, 1:2, metal complex, chrome dyes- pre, post &amp; simultaneous mordanting, basic dyes., dyeing of synthetic fibres: polyester-carrier, HTHP&amp; the mosol method, acrylic dyeing with basic dye, dyeing of nylon and their blends, problems associated with dyeing, common fault and their remedies, mechanism of dyeing, role of fibre structure in dyeing, heat of dyeing, entropy of dyeing, kinetics of dyeing –diffusion coefficient, diffusion in steady state and non steady state, rate</p>	<p>of dyeing.</p> <p>Mass coloration of man made fibres viz, polyester, nylon, acrylics, viscose, Dyeing machinery- Jet dyeing m/cs, Beam dyeing, Soft flow m/cs, Infra colour dyeing m/cs, closed jiggers and continuous dyeing ranges. Control and rectification of various problems in High temperature dyeing, thermo fixation process – pad liquor preparation, dyeing theory of nylon, leveling agents, swelling agents, faults and remedies in nylon dyeing.</p> <p><b>6. Textile Chemicals and Quality Testing:-</b> Quantitative chemical analysis of textile fibres and their blends, quantitative estimation of bleaching agents and dyes. colour fastness of dyes on textiles (wash, light, rubbing, hot press, perspiration) using National and International standards (BIS, AATCC, ISO), evaluation of wet treatments. evaluation of various chemicals, auxiliaries used in wet processing plants, analysis of fresh water and effluent, measurement of viscosity of chemical ingredients, printing paste, instruments used in chemical analysis. process and quality control in wet processing.</p> <p><b>PAPER-II</b></p> <p><b>1-Fibre:-</b> Regenerated &amp; synthetic fibres, concept of polymerization &amp; manufacturing process of regenerated &amp; synthetic fibres by melt, dry, wet &amp; dry-jet wet spinning methods, structure &amp; properties of regenerated &amp; synthetic fibres &amp; their uses, High performance fibres, their manufacture, properties &amp; application.</p> <p><b>2- Fabric testing:</b> gsm, thickness, cover, air permeability, moisture &amp; water transmission, wetting &amp; wicking properties, compressibility, tensile, tear &amp; bursting strength, abrasion &amp; pilling resistance.</p> <p><b>3-Chemistry of Dyes and Colour Chemistry:-</b> Colour and chemical constitution, Classification of dyes based on constitution, Different types of chromophores., unit organic process/operation- sulphonation, nitration, amination and halogenation, synthesis of major dye intermediates, azo dyes: Diazotisation and coupling reactions, azoic colours, acid mordant dyes, mono azo dye; diasazo, nitro, diphenylamine and anthraquinone dyes; acid mordant dyes, azo metal complex dyes, direct dyes. vat dyes: indigoid, anthraquinonoid and polycyclic quinonoid dyes; solubilised vat dyes. sulphur dyes and sulphurised vat dyes, reactive dyes: chlorotriazine and other halo heterocyclic compounds, vinyl sulphone based dyes, high fixation, highly substantive dyes, neutral fixing reactive colours, pigments- phthalocyanine pigments, other organic and inorganic pigments, optical brightening agents- fluorescence and phosphorescence, fluorescent brighteners for different fibres.</p> <p><b>4-Theory of dyeing and Colour Measurement:-</b> Evolution of theories of dyeing, fundamentals of kinetics and thermodynamics of dyeing, diffusion of dyes, methods for measurement of diffusion coefficient, effect of fibre structure on dyeability and diffusion of dyes, thermodynamic parameters like affinity and heat of dyeing, thermodynamics of dyeing cotton with direct dye, glass transition temperature and its influence on dyeing, source of natural light, sources of artificial light, CIE illuminants, absorption &amp; scattering of light. Beer-Lambert law, Kubelka-Munk's Equation. Computer aided Colour matching and recipe prediction.</p> <p><b>5-Technology of Printing:-</b> Introduction to printing, methods and styles of printing, classification of printing thickeners and methods of thickeners paste preparation, emulsion thickeners, synthetic thickeners, and mechanism of viscosity build up in emulsion and synthetic thickeners, Rheological behavior of thickeners., preparation of cloth for print paste preparation, wetting agents, hygroscopic chemicals dispersing agents, oxidative and reducing agents etc., precautions. methods of printing - block printing, roller printing, roller engraving and chroming, Screen printing- preparation of screens, rotary screen printing, rotary screen preparation-manual and photosensitive, its method of application, merits and demerits. Faults and prevention in printing methods, General methods of print fixation, and machines used for after treatment of printing goods steaming, ageing, curing etc., Pigment printing of cotton, binder emulsion, print paste recipe and steps involved., Various styles of printing- direct, resist &amp; discharge style of printing of cotton using direct, reactive, vat and indigosol colours.</p> <p>Printing of wool and silk with different dye classes such as reactive, acid, metal complex dyes using the above styles. Printing of synthetic and blends- Printing in different styles on polyester, nylon, acrylic and their blends such as P/V, P/C, wool/acrylic, wool/nylon and different types of union fabrics:cotton/wool, cotton/silk etc with different dye classes., Other techniques of printing like raised, metal and flock printing, Poly chromatic dyeing, foam printing, bubble printing etc. Spray printing, Tie and dye, Batik printing, Brasso printing, Transfer printing- fundamental principles of transfer printing, Sublimation transfer printing of polyester, machines used. Digital printing - Inkjet printing, concept and practice. , Printing of non wovens -carpets, hosiery goods and bonded goods, camouflage printing.</p> <p><b>6-Technology of Finishing:-</b> Objective of textile finishing, principle of finishing of cotton, wool, silk and linen. Classification of finishing – (a) Mechanical, Chemical, finishes. Finishing machines – mangle &amp; their function, drying machines, mechanical finishes- Stentering, calendaring, Sanforising, decatizing, embossing, seuding, compacting, raising., Beetling of linen, crimping of cilk &amp; rayon, finishing of woollen fabrics- dry wet decatizing, crabbing, felting, milling, permanent setting, shrink proofing, and special finishing of silk. Heat setting -objects, types of setting, mechanism of temporary set and permanent set, structural changes brought about by heat setting, heat Setting conditions of various yarns and fabrics, industrial practices of heat setting of polyester and its blends, various methods to determine the degree of heat setting, softeners and hand builders - desirable properties and various classes of softeners, properties, comparison of various softeners, classification of stiffeners, examples and their application, energy efficient technology-low liquor application, spraying, powder coating and foam technology, blow ratio, foam generator, stabilizer, applicator.</p> <p>Mechanism of creasing and theory of antcrease finish, wash-n-wear, low and no formaldehyde cross linking agents, application of BTCA and CA, Evaluation of wrinkle resistance, concept and mechanism of flame retardancy, flammability of textile fibres. concept of LOI. flame retardant and flame proof finishes on natural fibres, synthetics and blends, phosphorylation and phosphonylation, use of halogen derivatives, evaluation of flame retardancy, soil release finish – mechanism of soiling, steps of soil release and theory, different soil release finishes, soil repellency, fluorocarbons and teflon finish, standard test methods for the finish effect, water proofing and water repelling, mechanism of water repellency, chemistry and application of silicones, testing of water repellence Antimicrobial finishing, chemistry of various antimicrobial finishes, application and evaluation., Nano Finishes:- Concept of nano phase materials, various types of nano finishes, characterization and their application in textiles: e.g. self cleaning, anti bacterial, UV protection nano finishes.</p> <p><b>12. LEATHER TECHNOLOGY</b></p> <p><b>PAPER-I</b></p> <p><b>UNIT-I</b></p> <p><b>Microscopy and Bacteriology</b></p> <p><b>History:</b> Histology of hides and skins-cells., tissues, fibers, muscles, glands, epidermis,</p>
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<p>dermis etc. histological characteristics of buffalo and cow hides, goat and sheep skins, reptiles skins.</p> <p><b>Compound Microscope:</b> Mechanical and optical part of compound microscope, image formed, defects in eye pieces and their rectification etc. different types of microscopes.</p> <p><b>Microscopical slides:</b> Preparation of microscopical slides, finishing and hardening, embedding, sectioning, staining and counting the photomicrography.</p> <p><b>Fiber Structure and Assessment:</b> Orientation of fiber, structure in curing, soaking, limping, picking tanning and optimal conditioning of fiber structure in various types of leather assessment of leather.</p> <p><b>The Bacterial Cell and its Internal Structure:</b> Nutrition of bacteria and the preparation of culture media. Metabolism and respiration of bacteria-sterilization-effect of environment upon bacteria-isolation and identification of bacteria classification of bacteria usually found ion hides and skins-bacterial proteolysis disinfections and disinfectants-bacteriology of curing soaking, liming and bating.</p> <p><b>Mycology:</b> Isolation, identification and classification of fungi associate with leather processing, Morphology and physiology of fungi, Mycological problems of leather industry and their prevention.</p> <p><b>Entomology:</b> Influence of the following parasite diseases, skin leather quality and their prevention, warbles ticks, mosquito lice, insect damage to dry hides and skin caused by hide beetles and moths and their prevention.</p> <p><b>Leather Biotechnology:</b> Chemistry of DNA &amp; RNA, structure conformation, classification of enzyme, essentials of biotechnology, restriction of enzyme.</p> <p><b>UNIT-II</b>  <b>SKIN COMPOSITION, PROTEIN AND PRE-TANNING PROCESS</b>  <b>Chemical Constituents of hides and skins:</b> Variation fibrous and non-fibrous proteins, non-proteinous skin components.  <b>General and physical chemistry of proteins:</b> with special reference to hide proteins, chemical constituents of hides and skins, reaction of proteins with acids, base and salts.  <b>Structure of collagen:</b> primary structure of collagen, amino acid composition, molecular conformation amino acid sequence in collagen in relation to molecular conformation- X-ray diffraction pattern, the triple helix structure, electron microscopy of the collagen fiber.  <b>Aggregation phenomenon of collagen:</b> precipitated form of collagen, Kinetics of fibril formation.  <b>Thermal transition:</b> Thermal transition in collagen and their relation with amino acid composition and environmental-temperature, Denaturation temperature, Mechanism of Denaturation process, Renaturation of gelatin solution.  <b>Effect of enzymes on collagen:</b> Collagenesis, proteolytic enzymes, selective proteolysis and telopeptides.  <b>Reactive groups in collagen:</b> Modification of reactive groups of collagen modified proteins.  <b>Other skin properties:</b> Keratin, Reticulin, elastin- their chemical composition, structure and functions, nonfibrous skin proteins.  <b>Non proteinous skin components:</b> Lipids, carbohydrates vitamins, mineral constituents.  <b>Pre-tanning process:</b> Flaying, curing, defect of hides and skins, chemistry and principle of different pretanning process- soaking, liming, delimiting, bating, degreasing, pickling and depickling process control.</p> <p><b>UNIT-III</b>  <b>INORGANIC AND ORGANIC TANNING</b>  <b>Theory &amp; behavior of group elements:</b> Werners co-ordination theory, behaviour of group elements, chromium, Aluminium, Zirconium, Iron, Titanium, Difference between salts of these elements.  <b>Chrome Tanning:</b> Chromium complexes and their structures, study on the phenomena of hydrolysis, olation, oxolation, polymerization of chrome complexes, masking principle of masking, affect of masking on chrome tannage, Method of chrome tannage, preparation of chrome liquors and powders, influence of reducing agent on nature of chrome complexes mechanism of chrome tanning, variable parameters of chrome tanning.  <b>Vegetable tanning:</b> Mechanism of vegetable tanning, factors affecting vegetable tannage, process of vegetable tanning.  <b>Aluminium Tanning, Zirconium Tanning, Neutralization, Combination Tannage.</b>  <b>Collagen Tanning:</b> Concept of tanning, leather properties of dependent on tanning.  <b>Vegetable tannins, Hydrolysable tannins, Condensed tannins, Biosynthesis of plant polyphenols, Synthetic tannins, Resin and Polymeric Tannages, Aldehyde tannage.</b></p> <p><b>UNIT-IV</b>  <b>POST TANNING AND FINISHING OPERATION FOR LEATHER MANUFACTURING</b>  <b>Chemistry of Bleaching and Mordanting ayes:</b> Dyeing: Principles of colour chemistry, Classification of leather dyes, Blending of dyes, Principles of color matching, Theory and mechanism of dyeing, Dyeing methods, Light fastness of dyeing, Dyeing auxiliaries such as leveling agents, wetting agents, Dispersing agents and Dye fixatives.  <b>Leather Auxiliaries :</b> Fat Liquoring agents, Pigments, Binders, Lacquers.  <b>Washing, Neutralization, Oil, Fat and Fat liquoring.</b>  <b>Water Proofing.</b>  <b>Finishing Materials:</b> Properties, Chemistry and methods of preparation of Nitrocellulose lacquers and lacquer Emulsions, Wax emulsions, Silicone emulsions.</p> <p><b>UNIT-V</b>  <b>LEATHER PROCESSING</b>  <b>Processing of Leather From Goat skins:</b> Glazed kid, resin uppers, glazed uppers, shoe suede, garment suede, Lining leathers. Chamois leathers, printed leathers, morocco and book binding leathers, E.I. Goat skins and their dressing into different types of leathers.  <b>Processing of Leather From Sheep Skins:</b> Vegetable tanning and chrome tanning of sheep skins, conversion into different types of finished leathers-sheep nappa, garment, suede, uppers. Lining leathers, glove leathers, diaphragm leathers.  <b>Exotics and others:</b>  Reptile leathers, hair on tanning and dressing of fur skins.  <b>Upgrading of leathers:</b>  Retanning special finishing effects for up gradation of lower ends like Embossing, screen printing block printing, transfer film finishing, seal and Sink finish, popcorn effect, punching etc. Roller coating and other modern equipments, Burnishable and oil pull up leathers  <b>Heavy Leathers:</b> Vegetable tanned sole leathers, Bag tanning, different types of finished leathers, Belting leathers, Harness and saddlery leathers, Chrome and waxed soles, picking band leathers. Picker and apron leathers, Hydraulic and pneumatic leather such as hand pump leathers.  Leather for lification plants for air, Oil seal, Gas, etc. Sports Goods leathers like Football, Rugby ball, Volley ball, Hockey ball, Cricket Ball etc. Gloves leathers for wicket keepers, Batting, Boxing etc).</p>	<p><b>Light Leather:</b> Full chrome retan, hunting suedes, softies, nappa, and burnishable Upper leathers, Printed, Shrunken grain and upholstery leathers Water proof and water repellent upper leather, Nubuk and white leather. E.I. tanning, dressing of E.I. tanned leathers in to upper, lining, Bag leather, leather for leather goods kattas, bunwar etc.  Different types of leathers using chrome splits, Formulation and different dyestuffs, fat liquors, retaining agents.</p> <p><b>PAPER-II</b>  <b>UNIT-I</b>  <b>ANALYSIS OF WATER AND DIFFERENT CHEMICALS USED FOR MANUFACTURING OF LEATHER</b>  <b>Analysis of water:</b> Type of water – principle of analytical method employed in analysis of water effect of hardness of water on various processes in leather manufacture softening of water.  <b>Water Analysis:</b> Temporary hardness, Permanent hardness, Total hardness, Chloride content, Sulphate content, Iron content.  Analysis of Various Chemicals and Auxiliaries used in Leather Processing: Analysis of common salt, Analysis of lime-available lime, Total bases, Analysis of sodium sulphide, Aluminum salt, Delimiting agents, Bates, Neutralizing agents. Oils and Fats, sulfated oils, soap, fat liquors and other auxiliaries like resin binders, wax emulsions etc.  <b>Analysis of Liquors of beam House Processes:</b> Soak liquor, Analysis of used lime liquors-lime, sodium sulphide, salt content and Analysis of pickle liquor.  <b>Analysis of Tanning Agent:</b> Vegetable tanning materials and extracts, chrome extracts and liquors, zirconium and Aluminum Tanning agent, formaldehyde, Analysis of bate, Analysis of oils, moisture, acid value, saponification value, iodine value, unsaponifiables, Analysis of sulphate oils-moisture, pH, acid value, total alkalinity organically combined SO<sub>3</sub>, Na groups.</p> <p><b>UNIT-II</b>  <b>PHYSICAL, CHEMICAL AND INSTRUMENT ANALYSIS OF LEATHER AND QUALITY CONTROL OF LEATHER</b>  <b>Chemical analysis of pelts and Leathers:</b> Principles and methods of analysis of limed and pickled pelt, chemical testing of vegetable tanned/chrome tanned/aluminum tanned/zirconium tanned/ formaldehyde tanned, combination tanned leathers.  <b>Physical Testing of Leather:</b> Sampling position for physical testing of leather. Different methods employ for physical testing of leather. Principle involved in Static and Dynamic methods of non destructive testing of leathers. Different methods in testing of colour fastness of leathers.  <b>Standards and quality Control:</b> Quality control in leather processing, Rectification of defects in hides, Skin and Leathers, control of yield, colour and finish of leather etc. Physical and chemical characteristics (standard specifications) of various types of leathers.  <b>Instrument Analysis:</b> Potentiometry, non-aqueous titrations, conductometry chromatography, spectrophotometry and colorimetry, ion-exchange resins, electrophoresis. Principles and their application analysis.</p> <p><b>UNIT-III</b>  <b>TANNERY POLLUTION AND TREATMENT</b>  <b>Pollution:</b> Types of water pollution, physical, chemical, physiological and biological pollutants, Pollution effects of land ground after, surface water, aquatic life and sea.  <b>Tannery Effluents:</b> Types of tannery effluents, characteristics of effluents from Beam House Process, tan yard process and finishing yard process- Estimation of OD, BOD, COD, heavy metals (Ca, Cr, Pb and Hg) and total dissolved solids in waste water.  <b>Primary treatments:</b> Waste water drainage and collection system in tanneries, screens, equalization of waste water, primary treatment unit.  <b>Secondary Treatment Systems:</b> Lagoon treatment, aeration systems, trickling filter, design criteria, Biotechnology in effluent and disposals.  <b>Effluent Disposal:</b> Types of effluent disposal, standards and specification Indian Standards, specification for industrial effluent discharge.  <b>Water for Tanning:</b> Water for tanning process, recovery and reuse of water in tanning Industry, utilization of treated effluents.  <b>Solid Waste Management:</b> Solid wastes from tanneries origin and disposal, utilization sludge disposal from treatment system.</p> <p><b>UNIT-IV</b>  <b>LEATHER TRADE ENGINEERING</b>  Clutch mechanism, crank-slide and straight motion and lever mechanism and development of tannery machines.  Balancing and Vibration - their application in high speed slicking action for helically bladed cylinders, Bush, ball, roller and ring oil bearings, cam, springs and their application and function in tannery machines.  Development of hydraulic and pneumatic steering mechanisms accessories and control applied to tannery machines, air compressors, dust control equipment, blowers, etc. Automatic controls and their application in all Instruments, drying mechanisms and different types of dryers.  Detailed study of Beam-house, tanning and finishing machines, their description, construction with sketch, selection, Foundation and Erection of machinery. Latest development of leather processing vessels Internal transport, safety precautions, power, water and steam distribution, drainage and disposal in tanneries.  Maintenance of tannery buildings: Electrical, steam and water lines, tanning machinery, routing prevent maintenance, automatic and mechanization of tanneries.</p> <p><b>UNIT-V</b>  <b>LEATHER PRODUCT TECHNOLOGY AND COMPUTER AIDED DESIGN</b>  <b>OVERVIEW:</b> Classification of leather Goods &amp; Garments. Selection of materials Grading and assorting of Leathers for Leather Goods &amp; Garments. Property Requirement for Leather and Lining materials, Accessories for leather Goods and garments.  <b>CUTTING:</b> Hand and Machine Cutting, Pattern interlocking, various types of assembly Techniques, skiving, splitting, folding, Sewing Quality Control measures in Leather products manufacture.  <b>Machinery needs for leather goods manufacture.</b>  <b>Organization, Classification of leather based sports goods.</b>  Anatomy of human foot, Function of the foot, Foot comfort and Common foot abnormalities, Foot and Last measurement, Shoe sizing system and fittings. Designing and pattern making, Different types of footwear, Various components of footwear, Basics concepts of design and pattern cutting, Grading methods, Various allowances, Applications of computer aid designing, Materials of leather products- Selection of leather and non-leather materials for different components of footwear and garments.  Computer aided design, CAD, CPU, Data storage, Input/output devices, Function of CPU, Main memory and backup storage devices, Selection of Input/output devices, Operating system, Application of software for Footwear.</p>
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### 13. INSTRUMENTATION AND CONTROL PAPER-I

#### Basic Circuit Analysis :

Kirchoff's Laws – DC and AC circuits, Mesh and Nodal analysis for DC and AC circuits; Thevenin's, Norton, Superposition and maximum power transfer theorem; Magnetically coupled circuits; Transient response of RL, RC and RLC circuits. Characterization of two networks, Three phase circuits-balanced and unbalanced, phasor diagram of voltages and currents.

#### Electronic Devices and Circuits:

Diode, BJT, JFET, MOSFET-Structure, operation and Characteristics; LED, Laser Diode, Zenor diode-characteristics; Amplifiers-Small signal model analysis of CE, CB, CC amplifiers, gain and frequency response, multistage amplifiers, differential amplifiers; feedback amplifiers and oscillators; A/D and D/A converters, Boolean algebra, logic gates, design of arithmetic circuits, flip-flops, counter and shift registers.

#### Digital Signal Processing:

Classification of signals-continuous and discrete; energy and power, mathematical representation of signals; classification of system-continuous, discrete, linear, causal, time variance, stable, dynamic, spectral density, aliasing effect; Analog filter design, bilinear transformation, Discrete Fourier Transform, FIR and IIR filter realization.

#### Basic Instrumentation Engineering:

Introduction to instruments and their representation, Functional elements of measurement system, classification of instruments, standards and calibration, measurement system performance static characteristics-Error analysis, loading effect, Dynamic characteristics.

#### Transducers and Smart Sensors:

Classification of transducers, selection of transducers, characteristics of transducers, mathematical model of transducers-zero, first and second order transducers response to impulse, step, ramp and sinusoidal inputs, variable resistance, inductance and capacitance transducers; LVDT, strain gauges temperature transducers construction, characteristic and applications; capacitive and piezoelectric transducers – frequency response, Hall effect transducers, photo detectors, digital transducer; smart sensors, fibre-optic sensors, MEMS, Nano Sensors.

#### Industrial and Analytical Instrumentation:

Pressure, flow, temperature, liquid level- Principle of Operation, installation and maintenance; calibration, measurement of force, torque, velocity, vibration, humidity, viscosity and density; spectrophotometers (UV and IR); pH meters, conductivity meters; Analysers (O<sub>2</sub>, NO<sub>x</sub>, H<sub>2</sub>S), Chromatography, NMR spectroscopy, X-ray spectra copy and mass spectrometer.

#### Microprocessor and Microcontroller :

8085 and 8086 processor – Hardware, architecture, pinouts, functional building blocks of processor, memory organization, I/O parts and data transfer concepts, timing diagrams. Programming of 8085 Processor; 8051 Microcontroller-Hardware Architecture, pinouts-Functional building blocks, I/O parts and data transfer concepts, timing diagram, Interrupts, Comparison to Programming Concepts with 8085, Peripheral Interfacing-Study and need, architecture, configuration and interfacing with ICs 8255, 8259, 8254, 8237, 8251, 8279; A/D and D/A converter interfacing with 8085 and 8051; Microcontroller Programming and applications-Data transfer, Manipulation, Control Algorithm and I/O Instructions-Simple programming exercises, key board and display interface – closed loop control of servo motors, stepper motor control, washing machine control.

### PAPER-II

#### Control Systems :-

Open and closed loop systems, mathematical modeling of physical systems, Electrical analogy of mechanical and thermal systems, transfer function – Synchros, AC and DC servomotors – block diagram reduction techniques, signal flow graphs, Time response, time domain specifications, types of test input; first and second order system response, error efficient, steady state error; Root locus construction, Effects of P, PI, PID modes of feedback control, time response analysis, Frequency response – Bode Plot, polar plot, Correlation between frequency domain and time domain specifications – Effects of Lag, lead and lag-Lead compensation on frequency response; stability and compensator design – Characteristic equation, Routh-Hurwitz Criterion; Nyquist stability Criterion, state variable analysis , concept of state variables, solution of state and output equation in controllable canonical form – concepts of controllability and observability.

#### Power Electronics :-

Power Semiconductor devices – Study of switching devices, Diode, SCR, TRIAC, GTO, BJT, MOSFET, IGBT – Static and dynamic characteristics – triggering and commutation circuit for SCR, Design of driver and snubber circuit; Phase controlled converters – 2-pulse, 3-pulse and 6-pulse converters; Gate circuit schemes for phase control – dual converters, DC to DC Converters – Step-up and Step-down Chopper Control strategy; force commutated chopper; voltage commutated, current commutated, load commutated, switched mode regulators – Buck, boost, buck-boost converters, AC to DC Converters, Inverters – single phase and three phase inverters.

#### Electrical Machines and Drives :-

DC machines – generators – construction, principle of operation, types, emf equation, open circuit, Internal and external characteristics. DC motors – principle of operation – back emf, need for a starter. Single phase transformers – construction, principle of operation, phasor diagram, losses, SC and OC test, efficiency and regulation. AC Machines – 3 Phase induction motor – Construction and principle of operation, torque-slip characteristics. Synchronous machines – Alternator and motor – Construction, operation and applications. Single phase induction motors. DC drives and AC drives. DC and AC servomotor, synchros, stepper motor – Construction and working

#### Process Control Instrumentation:-

Introduction to process control : Process control block diagram – control system evaluation, Signal conditioning (analog). Final control operation – signal conversion (analog to digital), Actuators (electrical, pneumatic and hydraulic) – Control elements (mechanical, electrical and fluid valves). Discrete state Process Control; Characteristics of the system, discrete state variables, process specifications. Controller principles: Process characteristics – control system parameters – discontinuous controller modes – two position, multiposition, floating control mode, Controller modes – Proportional, Integral and derivative Control mode. Analog controller, computer based control. Pneumatic controllers. Control loops : control system configurations – dead time process – Capacity, describing functions, dead Zone, Dead band, Cascade control, Feed forward control – load balancing, steady – state model, ratio control, inverse Control. Process loop tuning : Control system quality. Process loop tuning – closed loop method, ultimate method (Ziegler Nichols method), damped oscillator method, process reaction curve method, frequency response method, comparing tuning method.

#### Logic and Distributed System :-

Components of PLC – advantages over relay logic – architecture of PLC – Programming

devices; discrete and analog I/O modules, programming languages – ladder diagram, programming timers and counters, design of PLC, Program control instruction, math instructions, sequence instructions : Use of PC and PLC, application of PLC, SCADA – data acquisition system, supervisory control, direct digital control, DCS – architecture, comparison, local control unit, Process interfacing issues, communication facilities, operator interfaces – low level and high level operator interfaces, operator displays, engineering interfaces – low level and high level engineering interfaces.

### 14. ARCHITECTURE

#### PAPER-I

#### 1. BASIC DESIGN & ARCHITECTURAL DESIGN

Role of an Architect in the built environment; Building process; Role of other professional in building; Architects act, C.O.A., I.I.A., NASA; Form and Transformations – Understanding and application of Additive, Dimensional, Subtractive concepts. Order in Architecture – Understanding and Application of Geometrical, Structural, Dimensional, Material, Spatial Order etc. Anthropometrics Studies – Understanding and application of human dimensions and functions; Space-activity relationships; Understanding of measure drawings etc. Elements of Space making – Understanding and application of elements of space making e.g. Floor, Wall, Door, Window, Column, Stairs, Roofs etc.

#### 2. BUILDING MATERIALS

Complete understanding of constituents, properties and application of traditional building materials e.g. Mud including stabilized earth, Burnt Bricks, Brick Tiles, Brick Ballast, Surkhi, Lime, Cement, Sand etc. Complete understanding of application of building materials e.g. Timber and its Classification, Characteristics, Defects, Preservation; Hardware e.g. Hinges, Handles, Knobs, Bolts, L-drops, Locks, Stoppers, Stays, Silencers, Chain guards, Closers, Catchers, Knockers etc. in various materials; Damp Proofing Courses e.g. Asphalt, Bitumen, Synthetic, etc.; Cement Concrete and its types (Plain & Reinforced), Mixing, Curing, Water Cement Ratio, Qualities and Workability etc.; Stone and its classification, availability, characteristics and application etc. Surface (Wall) Finishing & Painting and Polishing – Types and application of plasters; Jointing and Pointing; Cladding; Preparation of variety of surfaces; Application of various coats; Finishes – Lime/Colour wash; Dry distemper; Oil bound distemper, Cement paints; Acrylic emulsions; Synthetic enamels; Wall textures etc. Polishes and Varnishes. Roof Coverings and their constituents, properties and application of – Clay Tiles (Country, Allahabad, Mangalore tiles etc.); Stone Slating; Shingles; Thatch etc. Timber Products and their constituents, properties and application of – Variety of Plywood; Ply-board; Block board; Particle board; Wood wool cement board; Fiberboard; Compressed straw board; Cement fiberboard; Mineral fiber board; Veneers; Laminates etc. Glass & Ceramics Glass and their constituents, properties and application of – Translucent; Transparent and Special glasses; Glass bricks; Patch fittings for glazed partitions and shutters. Ceramics and their constituents, properties and application of – Terracotta; Faience; Fireclay; Stoneware; Earware; Vitreous China; Porcelain etc. Adhesives and their constituents, properties and application of – Natural Adhesives – Animal; Casein; Bituminous etc. Thermoplastic Adhesives – Polyvinyl Acetate etc. Thermosetting Adhesives & Plastics – Urea Formaldehyde; Phenol Formaldehyde; Melamine Formaldehyde, Resorcinol Formaldehyde; Epoxide Resins etc. Rubber Adhesive.

#### 3. BUILDING CONSTRUCTION

Element of Building – Terminology, Nomenclature of various parts of building from foundation to roof. Brick Work – Brick Terminology; Simple Bonds e.g. English bond & Flemish (single and double) bond in brick work for up to two brick thick walls; Details at quoins and junctions in English bond and Flemish bond for up to two brick thick walls; Details of piers (attached and detached); Buttresses; Lintel and Sill; Special Bond – Rat Trap Bond; Brick jaalis; Corbelling; Coping; String courses; Arches in brick and stone; Elementary principles; Centering; Cavity walls etc. Foundation – Its Need; Design criteria; Foundation concrete; Details of simple spread foundations for load bearing walls of various thicknesses up to two brick thick etc. Timber – Elementary carpentry; Common joints; Details of framed, ledged, braced and batten doors etc. D.P.C. – Horizontal and Vertical D.P.C. etc. Stone Work – Elementary Stone Masonry; Types of joints; Random, Course and Ashlar Stone Work in walls etc. Door, Window & Ventilator (Timber) – Types and details of Panelled door shutters and Mosquito proof door shutter; Types of Windows & Ventilators and details of glazed window and ventilator shutters and frames etc. Roof Terracing – Complete process of laying of terracing with provisioning of Gola & Khurra etc.; Lime concrete; Mud phaska with brick tiles; Brick coba etc. Temporary Timbering – Timbering of shallow trenches. Door (Timber Products) – Types and details of Flush door shutter with finishes. Door (Operational Mechanism) – Understanding of operational mechanism (automatic and manual) of variety of Sliding door shutters; Sliding-folding door shutters and Revolving doors shutters. Partition – Terminology; Partitioning methods with use of different materials e.g. Timber and Timber Products, Clay and Terracotta Brick/Block, Pre-cast Concrete Block, Wood Wool Cement Board, Compressed Straw Board, Glass and Glass Brick. Panelling (Timber & Timber Products) – Terminology; Panelling methods with use of materials e.g. Timber and variety of timber products. Brick Work Temporary Constructions - Shoring (Raking, Flying and Needle); Underpinning etc.

#### 4. ARCHITECTURAL DRAWING

Basic Technical Drawing – Concept and types of line; Division of lines and angles; Drawing polygons; Inscribing and circumscribing circles in polygons; Drawing geometrical curves helix; Conoid etc. Orthographic Projections – Vocabulary and concepts of Planes of Projections, First angle projections, Projection of points, Lines and planes in different positions; Projection of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in different positions; Sections of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in varying conditions of sectional plane etc. Development of Surfaces – Vocabulary and concepts of cubes, prisms, cylinders, pyramids, cones and spheres etc. Solid Geometry – Vocabulary and concepts for construction of section, Intersection and interpenetration of solid forms.

#### 5. APPLIED MECHANICS AND STRUCTURAL DESIGN

Elements of Statics – Force, Law of parallelogram of forces, Law of triangle of forces, Polygon Law of forces, Resolution of forces; Resultant of number of concurrent coplanar forces; Condition of equilibrium; Moment of force; Moment and arm of couple; Theorems on couples. Simple Stresses and Strains – Elasticity; Stress; Strain; Types of stresses; Elastic limit; Hook's law, Modulus of elasticity; Modulus of rigidity; Bulk modulus; Stresses in composite bars/section; Modular ratio; Equivalent area of a compound section; Primary or Linear strain; Poison's ratio; Shear stress; Principal stresses and strains (for simple cases); Mohr's circle etc. Centre of Gravity & Moment of Inertia – Methods of finding out center of gravity of simple figures; Centre of parallel forces; Important theorems; Calculation of moment of inertia of different shapes and its application; Moment of inertia of composite sections etc. Shear Force and Bending Moments – Shear force and Bending moment calculation and their diagrams for cantilever and simply supported beam and

<p>overhanging beam. Stresses in Beams – Simple beams bending; Section modulus; Moment of resistance; Shear stress in section of beam etc. Stresses in Trusses – Perfect frame; Redundant frame; Type of supports and their reactions; Analysis of cantilever and simply supported trusses by Analytical method, Method of sections and Graphical method etc. Torsional Stress in circular shaft – Pure torsion; Theory of pure torsion; Torsional moment of resistance; Assumptions in the theory of pure torsion; polar modulus; Power transmitted by a shaft; Torsional rigidity etc. Plain Cement Concrete – Concrete mix; Curing and strength of concrete; Effect of temperature; Shrinkage; Fatigue; Concrete mix; Curing and strength of concrete; Effect of temperature; Shrinkage; Fatigue etc. Deflection of Beams (Cantilever and Simply Supported) – Calculation of slope and deflection by Double Integration; Macaulay's Method and Moment area Method; Conjugate beam method etc. Column and Struts – End conditions; Buckling and critical loads; Slenderness ratio; Various column theories; Stress distribution of the section of an eccentrically loaded rectangular column; the middle third rule; Core or kernel of section (Rectangular and Circular sections) etc. Elastic Theorems &amp; Energy Principles and its Application in Simple Cases – Strain energy stored due to axial loading and due to bending; Law of reciprocal deflections; Betti's law; The first theorem of Castiglione; The second theorem of Castiglione etc. Statically Indeterminate Structures – Degree of indeterminacy; External and internal indeterminacy; Calculation of degree of indeterminacy for beams and frames etc. Fixed Beams – B.M. Diagram for a fixed beam for various loading; Effects of sinking of support; Advantages and disadvantages of fixed beams etc. Continuous beams – Clapeyron's theorem of three moments for two to three span of continuous beam; Effects of sinking of support etc. Moment Distribution Method – Basic Proposition; Relative stiffness; Analysis of continuous beams and portal frames for simple loading etc. Slope Deflection Method – Basic concepts; Basic formulae; Application to analyse Continuous beams and Portal frames for simple loading etc. Introduction to Design Methods – Working stress design; Ultimate load design; Limit state design; Limit state design versus Working stress design; Building code etc. Limit state design method – Understanding of Limit state; Characteristic strength and characteristic load; Design values; Partial safety factors; Factored loads; Stress strain relationship for concrete and steel; Yield stress; Provisions of IS codes; Loads and Load combination. Detailing of Reinforcement – Requirements of good detailing; Nominal cover to reinforcement; Spacing of reinforcement; Reinforcement requirements; Reinforcement splicing; Anchoring reinforcing bars in flexure; Curtailment of tension reinforcement in flexural members; Bar bending schedule etc. Analysis &amp; Design of Singly &amp; Doubly Reinforced Rectangular sections and Flanged Beams section – Bending of beam assumption; Moment of resistance; Modes of failure; Maximum depth of neutral axis; Limiting values of tension steel &amp; moment of resistance etc. Shear and Development Length – Shear stress; Diagonal tension; Shear reinforcement; Spacing of shear reinforcement; Development length; Anchorage bond; Flexural bond etc.</p> <p><b>6.ART IN ARCHITECTURE</b> Vocabulary of art; Relevance of art in architecture; Elements of Design – Line, Direction, Shape, Size and Form etc. Principles of Design – Unity, Texture, Colour, Tone Direction, Proportion, Form and shape, Solids and Voids etc. Different eras and movement in Art and their association with Architecture – Renaissance; Baroque; Realism; Impressionism; Fauvism; Cubism; Expressionism; Surrealism etc. Contemporary arts and artist in India – Works of Rabanindra Nath Tagore, Nand Lal Bose, Jamini Roy, Amrita Sher Gill, M.F. Hussain, Satish Gujral, S.H. Raza etc. Suitable materials for murals, sculptures, furniture, pottery and fountains for indoors and outdoors.</p> <p><b>7.ECOLOGY &amp; ENVIRONMENT</b> Vocabulary of ecology and environment; Basic concepts of ecology; Ecological factors – light &amp; temperature, precipitation, humidity, gases/wind, topography etc. Global warming &amp; climate change; Loss of bio-diversity; Desertification; Deforestation etc. Ecosystem – Kind of ecosystem; Structure; Function and energy flow of ecosystem; Ecological succession; Ecosystem development; Climax concept etc. Soil – Edifice Factors – Definition of soil; Formation of soil; Soil profile; Classification; Soil complex; Soil depletion, degradation and conservation; Relation of soil and build environment etc. Water Regimes – Water in nature; Water balance problem; Surface/ground water; Sources of water pollution; Ground water pollution; Marine pollution; Prevention control of pollution; Conservation &amp; management; Impact of human intervention on water. Air Pollution – Kinds of air pollution; Sources of air pollutants; Effects – Depletion of Ozone; Acid Rain; Prevention &amp; control of air – pollution; Noise pollution; Effect of human habit and human activity on atmosphere etc. Built Environment and Ecology – Interrelationship between man, nature and built-form etc.</p> <p><b>8.SURVEYING</b> Vocabulary of surveying &amp; leveling; Principles of surveying; Units of measurement; Scale; Signs convention etc. Chain Survey – Instruments used; Types of chain; Instruments for ranging, Setting out angles; Erecting perpendiculars; Selection of station; Methods of taking offset and Obstacles in chaining etc. Plane Table Survey – Plane table and accessories; Methods of plane table survey – Radiation; Intersection; Traversing and resection etc. Compass Survey – The prismatic compass; Surveyor compass and its uses; Reduced and whole circle bearing; Magnetic declination; Effect of local attraction etc. Leveling &amp; Contouring – Types of level; Booking and reduction of levels; Profile &amp; cross section leveling; Errors in leveling etc. Theodolite – Definition of different terms; Temporary adjustments; Uses of instrument; Measuring horizontal and vertical angles; Method of repetition; Extension of lines etc.</p> <p><b>9.BUILDING SERVICES</b> <b>WATER SUPPLY</b> Vocabulary of water supply; Need to protect water; Requirements of water supply to different types of buildings; Sources of water supply; Quantity and quality of water; Conveyance and distribution of water; Overhead tank; Underground tanks; Pipe appurtenances; Hot and cold water supply system in a low rise and high rise buildings; Distribution system in campus; Pipes and their size; Jointing and different fittings etc. Rainwater harvesting in buildings and building premises etc.</p> <p><b>SANITATION</b> Vocabulary of sanitation; Purpose and principles of sanitation; Collection and conveyance of waste matter; Quantity and Quality of refuse; Design and construction of sewer's and sewer appurtenances; Garbage and sewage disposal; Roof and surface water drainage; Rain water storage and water harvesting principles and methods; Sanitary appliances; Traps their variety; Pipes and joints; Sanitary pipes works below and above ground level. Knowledge of plumbing and sanitary system for a residence.</p> <p><b>ELECTRICAL</b> Terminology and architectural symbols (as per NBC/NEC) for electric installations in buildings; Need to generate and save electricity; Transmission and distribution of electricity (single and three phases); Procuring service connection etc. Lighting accessories – Wires and cables; Metering; Distribution panels/boards etc. for single and three phase supply; Guidelines for installation of fittings etc. Design of simple light and fan</p>	<p>circuits; System of connection of appliances and accessories e.g. series and parallel connection; Joint box system; Looping-in system etc. Various types of internal wiring systems e.g. cleat, casing and capping, batten and conduit (surface &amp; concealed). Protection against excess current, short circuit earth fault and protection against electric shock; Various types of protection devices e.g. switches, fuses and circuit breakers; Need for earthing of domestic fittings and appliances; Earthing and its relation with soil resistivity; Earth electrodes; Earth wires etc. Load assessment and selection of appropriate cross section of the conductor.</p> <p><b>ILLUMINATION</b> Terminology and units; Light and its characteristics – scattering, propagation, transmission, reflection, absorption, refraction and dispersion of light; Electromagnetic spectrum and visible radiation. Types of illumination schemes e.g. Ambient, Task, Focal and Decorative etc; Design considerations for illumination Schemes. Methods for lighting calculation – Watts per square meter, Light flux and Point to point method. Sources of light (Electrical) – Incandescent; Halogen; Low pressure (fluorescent, compact fluorescent, sodium, cold cathode neon); High pressure (mercury, metal halide, sodium); LED; Fiber optics etc. Types of Luminaries – Indirect; Semi-indirect; General diffusing; Semi-direct and Direct etc. Electrical and Illumination needs for individual spaces e.g. Living room, Dining room, Bed room, Kitchen, Toilet, Staircases and Corridors etc. Types of electrical luminaries; e.g. Recessed mounted luminaries, Spot/Projectors; Surface mounted luminaries; Decorative luminaries; Pendant luminaries; Free-floor-standing luminaries; Up lights; Trunking lighting systems; Down Lights etc.</p> <p><b>AIR CONDITIONING SYSTEMS</b> Vocabulary of air conditioning services; Principles of Air Conditioning System Design; Refrigeration Cycle; Psychometric chart; Cooling load etc. AC systems – Comfort cooling systems &amp; their working – Unitary air conditioning – window AC &amp; split AC; Package AC system; Evaporative cooling systems; Central air conditioning their parts – A.H.U.; Cooling plant; Cooling tower etc. Air Distribution Systems – Fans; Filters; Fan coil units; Ductwork; Outlets; Dampers etc.</p> <p><b>LIFT SERVICES</b> Vocabulary of lift services; Average travel lift carrying capacity; Rated load; Rated speed; RTT etc.; Grouping of lifts and design standards of a lift lobby; Types of Lifts; Working of lifts with details of lift section describing various parts of lifts. Types of Escalators; Function and Working of Escalators.</p> <p><b>10.VERNACULAR ARCHITECTURE</b> Vocabulary of Vernacular Architecture; Sense of Place, Spontaneity &amp; variation; Control; Open ended form relationship; Symbols &amp; Meanings; Issues of concern in present day architecture and causative forces of the vernacular form etc. Vernacular and traditional architecture of India, specifically in varied climatic zones etc.</p> <p><b>11.INTERIOR &amp; FURNITURE DESIGN</b> Vocabulary of interior design; Enclosing elements e.g. walls, floors, ceilings, openings, staircases, furniture; Design elements e.g. color, light, textures etc. Principles of interior design etc. History of Interior &amp; Furniture Design – Evolution from ancient to modern, post-modern ideologies to contemporary (Egyptian, Greek, Roman, Gothic, Baroque, Renaissance, Arts and Crafts Movement, Art Nouveau, De Stijl, Modernism, Post Modernism and Contemporary), etc. Ergonomics, materials, finishes &amp; their applications in Furniture &amp; other Interior Elements; Characteristics and workability of various materials used in interiors etc. Modular concepts in furniture design; Mass production and fabrication; Codes and specifications etc.</p> <p><b>12.HOUSING</b> Housing Need and Demand in India – Present and Future; House, Housing and Settlement; Detached and Attached House Types; Net &amp; Gross Residential Density; Perceived Density; Zoning etc. Settlement Patterns – Human settlement; Settlement types and patterns; Relation of housing in present day context with relation to human settlement patterns etc. Issues Affecting Housing – Climate Change; Social Factors; Affordability; Health; Safety &amp; Security; Noise Control; Utilities and Services etc. Objectives and role of government, urban local bodies and other agencies in housing development; Census; NSSO; HUDCO; State Housing Board; NBO etc. Housing schemes – Rajiv Awas Yojana (RAY); Pradhan Mantri Awas Yojna (PMAY); Site &amp; Services Scheme; Rental Housing Policy; Slum Rehabilitation Policy etc. Housing categories e.g., Condominiums, Co-operative Housing, Affordable Housing, Rural Housing, - Their Advantages and disadvantages; Neighborhood Planning etc.</p> <p><b>13.BUILDING SOCIOLOGY</b> Vocabulary of sociology; Sociology and Architecture; Basic concepts – Society, Group, Community (Rural and Urban), Association, Institution etc. Culture and Society – Concepts of culture, Cultural identity and cultural diversity, Factors of socio-cultural changes etc. Social Development – Concepts of social development; Types of development – rural, urban and rural etc. Demography – Population growth and its impact; Population subsistence; Migration etc. Social Institutions – Family; Marriage; Religion etc. Social Infrastructure – Education; Health; Recreation etc.</p> <p><b>14.SPECIFICATIONS, COST ESTIMATION AND BUDGETING</b> Specifications – specifications of various materials and building works as per National Building Code (NBC) and Energy Conservation Building Code (ECBC) etc. Estimation – Types of Estimates – Preliminary; Plinth area; Cubical content; Approximate quantity, Detailed/Item rate method estimates etc. Method of Estimation – Separate/Individual wall; Centre line methods etc. Rate Analysis – Labor out turn and norms of consumption of basic materials; Principles of analysis of rates; Market/DSR rates of labor and materials. Preparation of Bill of Quantities (BOQ). Accounting Procedures – P.W.D./C.P.W.D. accounts procedure; Measurement book; Daily labor; Muster roll; Stores, stock and issue of material from stock; Indent form; Impress account; Cash book; Mode of payment etc. Valuation; Budgeting for projects etc.</p> <p><b>15.PROFESSIONAL PRACTICE</b> The architectural profession and the role of professional bodies and statutory bodies e.g. the Indian Institute of Architects etc. Their objectives, working constitution, bye laws, categories of membership, election procedure etc.; Detailed study of the Architects' Act 1972; Council of Architecture and its role etc. Conditions of engagement of an architect – Duties, responsibilities and liabilities of an architect towards the profession and society, Scale of professional charges and mode of payment; Code of professional conduct and ethics; Need and types of competitions; Procedure for conducting competitions etc. Tenders and Contracts – concept of contract and essential elements of contract; Tenders; their need and types; Preparation of tender documents and procedure for awarding tenders and award of projects; Type of building contracts; Preparation of contract document – General conditions of contract, defect liability period, running &amp; final payment, retention amount and virtual completion etc. Office organization and Management – Setting up practice e.g. Business organization, Types of offices – Proprietorship, Partnership, Private Limited etc.; Salaried appointments – Public sector, Private sector,</p>
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<p>Understanding of Income tax and GST; Understanding of office accounting procedures; Office procedure in government organization etc. Concepts of Valuation; Classification and types of valuation; Elements and factors affecting valuation; Valuation of immovable properties; Techniques for valuation of landed and building property etc. Concept and need of Arbitration; Law governing arbitration in India – Salient features of the Indian Arbitration Act 1940 and provisions in subsequent amendments; Role of arbitrator; Nature of arbitration; Appointment of arbitrator and umpires, Conduct, powers and duties of arbitrators and umpires; Procedure of arbitration and preparation of awards etc.</p> <p><b>16. URBAN DESIGN</b></p> <p>Urban Space – Historical and contemporary example of urban space e.g. Piazza del campo, St. Peters, Campidoglio, St. Marco; Yerba Buena garden, San Francisco, Pike place market, Seattle Washington; Indian cases, particularly towns on bazaars &amp; streets etc. Urban design Parameters – Space and place; Morphology; Urban form and structure; Fabric; Texture, Grain; Enclosure; Human scale; complexity etc. Basic Principles and Theories of Urban Design – Theories related to visual or perception aspect (Garden Cullen); Theories related to physical aspect (Kevin Lynch); Theories related to social aspect (Jane Jacob) etc. Urban Design Details – Urban outdoor lighting; Urban green infrastructure; Acoustic consideration for urban fabric Air quality at street level etc.</p> <p><b>17. HISTORY OF ARCHITECTURE</b></p> <p>Understanding of the development of architectural form with reference to technology, style and character of following styles of architecture. Also to comprehend and analyze spatial character, scale and structure through historical and traditional built forms of the following periods. – Prehistoric Age; Birth of Civilization; Ancient River Valley Civilizations of Egypt and Mesopotamia; Ancient Civilization of Aegean; Classical Period of Greece and Rome etc. – Indus valley civilization; The Aryan civilization; Buddhist; Hindu – Indo-Aryan and Dravidian; Jain etc. – Early Christian; Byzantine; Romanesque; Gothic; Renaissance; Mannerism; Baroque etc. – The Sultanate Style; Provincial; Mughal; Colonial etc.</p> <p><b>18. ARCHITECTURAL PHOTOGRAPHY</b></p> <p>Vocabulary of architectural photography, Various types of compositions framing, silhouette photography etc. Types of Camera – Use of various cameras; Lenses and accessories; SLR, DSLR cameras; lenses for different focal lengths for various contexts; Use of wide angle, normal, tele, zoom, macro, close up lenses etc. Filters-UV, Skylight, Colour filters, special effect filter etc. Shutter speeds – Slow, normal and high and their various applications etc. Apertures – Application of various apertures to suit different lighting conditions and to enhance depth of fields etc.</p> <p style="text-align: center;"><b>PAPER-II</b></p> <p><b>1. ARCHITECTURAL DESIGN</b></p> <p>Structural Systems – Understanding and application of various structural systems e.g. Trabeated, Arcuated, Vector, Form Active, Tensile etc and their relation to form, materials and function; Their mechanism of load bearing, adaptability, efficiency and limitations. Context – Understanding and application of the importance of 'context' and built urban environment in design. Sustainability – Understanding and application of active methods for achieving sustainability e.g. Water harvesting, Waste management, Solar and Wind Energy etc.</p> <p><b>2. BUILDING MATERIALS</b></p> <p>Metals (Ferrous) – Constituents, properties and application of – Iron (Pig, Cast &amp; Wrought); Variety of Mild Steel sections – Sheets (plain &amp; corrugated), Flats, Bars (round &amp; square), Angles (Equal and Unequal), R.S. Sections (I beams, Channels, Tees); Hollow Tubular sections available for application in building industry; Stainless steel and Alloys. Floor &amp; Floor Finishes – Constituents, properties and application of – Brick; Cement Concrete; Stone; Terrazzo; Chequered Tile; Ceramic Tile; Vitrified Tiles; Wooden etc. Reinforced Brick Work and their constituents, properties and application of – Types, Mixing, Curing, Water Cement Ratio, Qualities and Workability. Metals (Non Ferrous) – Constituents, properties and application of – Copper and Copper based alloys (Brass &amp; Bronze); Tin; Cadmium; Chromium; Zinc; Lead and Nickel etc; Metal Coatings – Electroplating, Anodizing etc. Various additives and admixtures and their constituents, properties and application of – Cementitious (crystalline) systems; Integral systems; Proprietary systems; Cementitious Coating system etc. Construction equipments and their application – Electric hand tools; Vibrators; Pumps; Compactors/Rollers; Earth Moving &amp; Excavation – Dozers; Scrapers; Graders; Shovels; Backactor; Dragline; Trencher sets, Transportation – Lorries; Trucks; Dumpers; Hoist; Cranes (mobile, static, tower); Concrete mixers and pumps for ready mix concrete etc. Gypsum &amp; Asbestos Products – Constituents, properties and application of Gypsum Boards, Suspended Ceiling (Board &amp; Tiles), Gypsum Plaster; Their components and accessories; Their jointing and finishing; Constituents, properties and application of Asbestos Cement products etc. Water Proofing Compounds – Constituents, properties and application of Neoprene, Butyl, EPDM, PVC, Polyurethane etc. Plastics and Rubbers Thermoplastics – Constituents, properties and application of Polythene, Polyvinyl chloride, Polypropylene, Polymethyl methacrylate, Acrylonitrile butadiene styrene etc.; Thermosetting Plastics – Constituents, properties and application of Phenol formaldehyde, Urea formaldehyde, Melamine formaldehyde, Polyurethane, Silicone resin etc.; Constituents, properties and application of Rubber etc. Forms of Steel for Industrial construction &amp; Roofing products – Classification, availability, characteristics and uses of forms of steel and first to fourth generation steel roofing products. Advanced Structural Concretes, Materials for Pre-Stressing – Classification, availability, characteristics and uses of Structural light weight concrete, High strength concrete etc. Forms &amp; Materials for Speedy Construction – Classification, availability, characteristics and uses of Reinforcement types, RMC etc.; Advanced Formwork systems – Table Form/Flying Form; Column Formwork Systems, Horizontal Panel Systems, Vertical Panel Systems, Jump Form, Slip form &amp; Tunnel Form.</p> <p><b>3. BUILDING CONSTRUCTION</b></p> <p>Structural Steel Works – Typical metal joinery – Mechanical (riveted &amp; bolted), Soldering and Brazing and welding; Detailing of structural steel work – Beam to Column joint, Beam to Beam joint, Column Splice, Column Base, Roof Truss to Column Joint, Steel Stairs etc. Doors &amp; Windows (Metals) – Mild steel L and Z section; Pressed steel section etc. Shutters (Operational Mechanisms) – Application of operational mechanism (automatic and manual) of variety of Rolling shutters and Collapsible shutters etc. Reinforced Brickwork – Reinforced brick piers, lintels, slabs and projections etc. Floor/Dado/Skirting – Complete process of laying of floor and skirting – Brick, Cement Concrete, Mosaic and Terrazzo floors. Laying and fixing of Stone slabs, Chequered Tile, Ceramic tiles, Vitrified tiles and Wooden (parquet and plank) on subfloors and walls. Doors, Windows &amp; Partitions (Aluminum) – Classification, availability, characteristics and uses of Doors frames and shutters; Windows Frames and Shutters; Partitions Framework &amp; fixing with other suitable materials etc. Temporary Constructions – Classification, availability, characteristics and uses of Centering, Shuttering and scaffolding R.C.C. (Formwork &amp; Laying) – Foundations – Isolated, Combined, Cantilever, Eccentric footing; Grillage and Raft foundation; Pile foundations – details of pile, varieties of piles, pile caps; Columns, Lintel,</p>	<p>Projections/Chujjas and Beams; Staircases – Waist and Folded slab; understanding of steel reinforcement types, laying, bending and binding. Partitions &amp; False Ceilings (Gypsum Board) – Classification, availability, characteristics, uses and construction details of Metal Stud Partition (single layer); Suspended Ceilings etc. Water Proofing Works – Classification, availability, characteristics, uses and construction details of Basements, Toilets, Kitchens, Terrace gardens etc. Joints – Classification, availability, characteristics, uses and construction details of Expansion joints; Seismic joints etc. Doors &amp; Windows (P.V.C.) – Classification, availability, characteristics, uses and construction details of Door Frame and Shutters; Windows Frames and Shutters etc. Defects and Remedies – Classification, availability, characteristics, uses and construction details of various defects in buildings and their remedies; Defects caused by dampness, Defects caused by applied forces and changes in size. Industrial Construction (Structural Steel Works) – Classification, availability, characteristics, uses and construction details of Portal Frame Construction, North-light truss and Lattice girder roof with various roof coverings. Pre-stressed Concrete – Methods of pre-stressing, types of post-tensioning systems; Types of pre-stressed concrete structures – Beams (Short span, medium span, long span), Girders &amp; Joists. Slabs (one way, two way, flat slabs, hollow core slabs, planks), Single &amp; Double T slabs. Channel sections, Folded plate structures etc.; Composite construction. Prefabrication &amp; Precasting – Classification, availability, characteristics, uses and construction details of open precast system, large panel precast system, joints, pre-casting methods, materials, on-site and off-site prefabrication, components, etc.; Precast RCC Frames – Beams and Column Frames, Wall Frames, Hollow core slabs, Planks and Tee slabs resting on Beam &amp; Column frames and Wall frames. Connections between various components – beam to column, column to column, beam to slab, wall to slab etc. Speedy Construction – Methods, Types of floor construction – cast in situ, precast &amp; composite construction; One-Way Slabs – Solid slabs, Slabs with wide beams, Ribbed slabs (One-Way Joists); One-Way joists with wide beams; Troughed slabs (ribbed slabs with integral beams and level soffits); Two-Way Slabs – Solid slabs; Waffle slabs designed as Two-Way slabs; Waffle slabs designed as Two-Way slabs with integral beams and level soffits; Flat slabs; Flat slabs with drops; Flat slabs with column heads; Waffle slabs designed as flat slabs; Lift slab construction; Cast-in-situ service &amp; stair cores; Cross wall &amp; Box frame construction etc. Modular Coordination – Aims, basis, planning, dimensioning; Assembly of components, tolerances, positioning of functional elements – slabs, walls, staircases etc.</p> <p><b>4. ARCHITECTURAL DRAWING</b></p> <p>Metric Drawing – Vocabulary and concepts of types, uses and advantages; Isometric, Axonometric and Pictorial view etc. Perspective Drawing – Vocabulary and concepts of application and use; Differences with metric projections; Anatomy of a perspective e.g. cone of vision, station point, picture plane, eye level, horizon line, ground line, vanishing point, etc.; Types of perspective – One point, Two points and Three point perspectives etc. Shades and Shadows – Vocabulary and concepts of values in shades and shadows; Constructing shadows in plan, elevations and 3-D etc.</p> <p><b>5. STRUCTURAL DESIGN</b></p> <p>Analysis and Design of R.C.C. Slab – Analysis and Design of one way, two way and flat slabs and detailing of its reinforcement etc. Analysis and Design of R.C.C. Beam (Continuous) – Analysis and Design of R.C.C. continuous beam and detailing of its reinforcement etc. Analysis &amp; Design of Portal frame (R.C.C.) – Analysis and design of portal frame (Single bay, Single storey) with fixed and hinged base, in R.C.C. etc. Analysis and Design of R.C.C. Stairs – Type of stairs; Effective span of stairs; Loading on stairs; Analysis and design of stairs (dog legged with waist slab) and detailing of its reinforcement etc. Elementary Soil Mechanics – Classification of Soil; Properties of Soil; Safe bearing capacity; Active &amp; Passive earth pressure etc. Analysis &amp; Design of R.C.C. Column – Effective height of column; Assumptions; Minimum eccentricity; Analysis and design of short R.C.C. column under pure axial load as well as under axial load and bending moment and detailing of its reinforcement etc. Analysis &amp; Design of R.C.C. Foundation &amp; Footing – Type of foundation; Depth of foundation; Theory &amp; design of axially loaded isolated square footing and detailing of its reinforcement; Pile foundation – Introduction, classification and its application etc. Analysis and Design of R.C.C. Retaining wall – Types of retaining walls; Analysis and Design of cantilever retaining walls and detailing of its reinforcement etc. Analysis and Design of Steel Structure – Various types of connections – Riveted connection – Introduction, Classification, Strength of riveted joint; Bolted connection – Introduction, Classification of bolts based on type of load transfer, Terminology, Specifications for spacing and edge distance of bolt holes as per I.S. 800-2007, Types of bolt connections, Type of actions on bolts, Design strength of plates in a joint, Design strength of bearing bolts; Welded connection – Introduction, Types of welded joints, Important specifications for welding as per IS code, Design strength of welded joints; Analysis and Design of various types of members – Tension members – Design Strength, Analysis and design; Compression members – Slenderness ratio, Actual length, Effective length, Design strength; Analysis and design; Steel Structure – Understanding of Miscellaneous Structural Elements – Beam and plate girder &amp; its use in building industry; Grillage foundation and its components &amp; its use in building industry; Types of roof trusses and nomenclature of its members etc.</p> <p><b>6. ART APPRECIATION</b></p> <p>Grammar of the language of art – Natural; Realistic; Symbolic; Abstract; Modern; Contemporary etc. Ideologies of Aesthetics in Art – Understanding of Ideologies of aesthetics in art while discussing the art of Western and Oriental; Plato, Aristotle, Baumgarten, I.A. Richards, Leo Tolstoy, Sigmund Freud; Shadanga; Six limbs of Indian painting; Rasa theory of 'Bharat Muni'; Iconography etc. Development of Art Development of art over the period of time; tracking the progress in art in aspects of the Functional diversity of styles; Art as from of social consciousness; Impact of Cultural and Religion on art; Understanding the role of art in contemporary society etc.</p> <p><b>7. CLIMATOLOGY</b></p> <p>Vocabulary of climate; Importance of climate in architecture; Factors affecting climate; Elements of climate; Solar radiation, temperature, wind, humidity &amp; precipitation and their measurement etc. Climate types – Climate types all over the world; Tropical climate; climate zones, their characteristics &amp; responses of the traditional/vernacular, Micro Climate &amp; Site Climate etc. Human thermal comfort – Body's heat production &amp; heat loss; Comfort zone; Bio-climatic chart; Effective temperature isopleths etc.; Various models of Thermal Comfort – Static &amp; Adaptive Mode, thermal indices &amp; their applicability. Solar chart – Solar position of a place, azimuth, altitude, incidence, using shadow angle protractor for designing shading devices. Daylight – Natural lighting; Glare; Day light factor &amp; factors affecting day-lighting in various space types; Principles of day-lighting in tropics. Ventilation &amp; Air Movement – Requirement; Size &amp; position of openings; Air-flow pattern inside &amp; outside buildings etc. Orientation – Orientation of buildings in relation to sun &amp; wind; Design strategies in different climate zones; Vernacular and contemporary responses to climate etc.</p> <p><b>8. ADVANCED SURVEYING &amp; GEOMATIC TECHNIQUES</b></p>
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Total Station Survey – Working principle of total station and its use; Use of software for different applications etc. Photogrammetry – Vocabulary, Principles and application of photogrammetry and stereoscopy in surveying etc. GIS (Geographic Information System) – Understanding and application of geographical concepts and terminology; Difference between Image Processing system and GIS, Utility of GIS; Raster and Vector Data; Raster Versus Vector; Raster to Vector conversion; Remote Sensing Data in GIS; Topology and Spatial Relationship; Data storage verification and editing; Data preprocessing; Georeferencing; Interpolation of data; Database Construction; Data Output; GIS analysis functions; Generation of thematic maps; Digital Elevation Model (DEM) etc. Remote Sensing – Understanding concepts of remote sensing; Electromagnetic spectrum; Platforms and sensors; Remote sensing data products; Understanding of visual and digital image interpretation techniques and image processing software; Field verification etc. GPS (Global Positioning System) – Understanding concepts of GPS surveys; GPS data collection for mapping etc.

### 9. BUILDING SERVICES

#### FIRE PROTECTION

Causes and spread of fire; Fire triangle/tetrahedron; Classes of fire; Combustibility of materials and fire resistance etc. Fire Detection & Alarm Systems; Equipment – Heat & Smoke sensors etc. Firefighting equipment & Extinguishing techniques; Ladders; Snorkel ladder; Firefighting pump and water storage; Hose and hose fittings; Dry and wet risers; Automatic sprinklers; Portable fire extinguisher etc. Means of escape; Fire escape staircase; Fire doors; Water curtain etc.

#### ELECTRONIC SECURITY AND SURVEILLANCE SYSTEMS

Perimeter Protection – Barriers, Doors, Gates, Turnstiles and Fences; Intrusion Detection Sensors and Systems – Outdoor & Indoor, Access Control Systems; Locks & Emergency Exits; Visitor Management Systems; Identification Systems – PIN, Card, Wireless and Biometric systems etc. Security Lighting, Illumination including Infra-red; Understanding CCTV cameras – Pan, Tilt & Zoom mechanisms; Digital and Analog Recording etc.

#### ADVANCED SERVICES

Gas Installation – L.P.G/Bio-gas installations, their location and layouts in residential and non-residential buildings etc. Automated Parking System – Vocabulary; Types; Working and Advantages of automated parking systems etc. Mechanical Ventilation – Standard requirements of ventilation for different conditions of living and work places; Conditions for comfort; Control of quality, quantity, temperature and humidity of air etc. Waste Treatment & Management – Vocabulary; Reduce-Reuse-Recycle; Waste collection; Treatment & disposal; Thermal treatment; Dumps and Landfills; Biological waste treatment; Waste water treatment etc. Integrated Building Management System – Objectives of the Integrated Building Management System, Various components of IBMS; Types of integration with the utility, safety and security systems and its designing and installation etc.

### 10. ARCHITECTURAL CONSERVATION

Vocabulary of conservation; Various issues and practices of Conservation; values and ethics; Causes of defects and decay of a heritage structure; Natural agents of deterioration and loss; Documentation for the conservation & restoration of the any Heritage built form; Status of conservation in India and the various agencies involved in the field of conservation worldwide and their policies; Various guidelines for the preservation, conservation and restoration of buildings; Management of historic sites; Understanding of various charters; Character and issues of heritage towns in India; Role of INTACH, UNESCO, ICOMOS and other such organizations etc.

#### 11. DISASTER MITIGATION AND MANAGEMENT

Hazards & Disasters; Indian scenario; Understanding of disaster; Hazard and its classification; Vulnerability; Capacity; Risk etc. Various Types of disasters – Cause, adverse effects, distribution patterns, mitigation measures of Earthquake, Tsunami, Cyclone, Flood, Landslide etc. Disaster Management cycle – Disaster Preparedness; Disaster Management Act; guidelines NDMA; Vulnerability Assessment & warning systems; Risk assessment etc. Disaster Response; Programmes for disaster reduction, Communications. Disaster Mitigation; Pre disaster, emergency, transition and recovery; Disaster management plan; Natural crisis management committee; State crisis management group; Disaster Damage Assessment etc. Disaster Resistant Construction Techniques; Risk reduction measures through land use control; site planning and land management; design and construction of structures for above mentioned disaster.

#### 12. URBAN PLANNING

Elements and planning principal of cities; Shapes of city plan in accordance to road networks; Concepts, theories and principles of urban planning of cities – Indus Valley, Ancient (Vedic), City beautiful movement (Chicago, Chandigarh), Urban Utopia (Broadacre), Garden city (Letchworth); Radburn Theory (Radburn) and Neighborhood planning etc. Understanding of planning process; Relevance of standards in planning as per URDPFI guidelines prepared by TCPO etc. Awareness of concepts related to various traffic problems in India; Understanding of PCU; Traffic volume; Road capacities; Road types and their sections and intersections; Traffic calming as per IRC guidelines; New concepts in mass and rapid transportation systems e.g. BRT, LRT and Metro rail etc. Modern Approach in Planning – Green City, Compact City, Smart City etc.

### 13. BUILDING ECONOMICS

Vocabulary of Economics; Scarcity; Utility – Marginal, Total & Average; Laws of Demand and Supply; Economic system in India; Building Efficiency; Building Life-cycle; Costs and Benefits of Building – Monetary and Non-Monetary etc. Project Financing – Equity; Financing Institutions in Financing Process; Interim Finance and Permanent Financing; Bank Loan – Simple Interest and Compound Interest; Types of Mortgage; Lease Arrangements etc. Economic performance of building – Decision Making using techniques of economic performance to measure tangible and non-tangible issues – Cost-Benefit Analysis, Incremental Analysis and Multi-Criteria analysis etc.

### 14. LANDSCAPE DESIGN

Factors affecting Landscape; Elements of Landscape Design – Natural and design elements; Principles of Landscape. Design – Unity, Symmetry, Balance, Hierarchy, Repetition, Sequence etc.; Different garden styles etc. Landscape Engineering – Road and Parking; Paths and Plazas; Wall, Steps, Ramps and Decks; Planters, Bed edges and Terraces; Pools and Water bodies; Terrace landscape and Vertical garden etc. Classification of Plants – Trees, shrubs, groundcovers, flowering plants, creepers and climbers etc.

### 15. PROFESSIONAL PRACTICE

Law related to Land – Understanding of the Land Acquisition Act – 1894 and its subsequent amendments through Act of 2013 and 2015; LAND ACQUISITION AMENDMENT BILL 2018; Notification to acquire land under various sections, concept of public purpose and compensation apportionment etc. The Uttar Pradesh Urban Buildings (Regulation of Letting, Rent and Eviction) Act, 1972-its important provisions and effect on the urban development; Urban Development Law – Understanding of the UP Urban Planning and

Development Act-1973 – Concept of Urban Development Authority its power authority and Role in regulating the urban development; Salient features of the provisions of the act; The Uttar Pradesh Slum Areas (Improvement and Clearance) (Amendment) Act-1981 and its important provisions for achieving etc. Law of Easement – Concept of Easement and essential elements of valid easement; creation of easement – Types of Easement, Easement by prescription, Easement by necessity and quasi easement; Termination, suspension and revival of easement and other related concepts etc. Mercantile Law – The Contract Act – 1872 and subsequent amendments – Concept of Agreement; Essential elements of Contract; Flaws in contract etc.; Indian Partnership Act – 1932 and subsequent amendments; Relationship of Partners; sharing of profits; Exit of a partner; Liabilities of and rights of other partners etc. The Law of Environment – Understanding of purpose, provisions, and the impact of various components of the environmental law e.g. The National Green Tribunal Act-2010; The Air (Prevention and Control of Pollution) Act-1981; The Water (Prevention and Control of Pollution) Act-1974; The Environment Protection Act, 1986; The Hazardous Waste Management Regulations etc. Real Estate (Regulation and Development) Act, 2016 (RERA) – Understanding of real estate; Need of the RERA and its impact on real estate; RERA authority; Registration under the Act; Role and responsibilities and liabilities of architects under the provisions of the RERA etc.

### 16. BUILDING CONSTRUCTION MANAGEMENT

Vocabulary of construction management; Project management concepts-objectives & scope, planning/monitoring and control, scheduling/Quality and cost; Theory of probability and statistics; Cost model and cost optimization etc. Construction Management Techniques – Construction Planning scheduling and controlling phases; Levels of details & time scale Resource scheduling; Smoothing & leveling; Project execution; Monitoring & progress reporting; Use of Management techniques – Bar charts and limitations of bar charts; Mile Stone Chart etc. PERT and CPM – Event; Activity; Dummy; Network rules; Graphical guidelines for network; Numbering of events; CPM network analysis & PERT time estimates; Time computation & network analysis; Cost time analysis in network planning using CPM etc. Resource Allocation & Quality Control – Resource usage profile – Histogram, Resource smoothing and Resource leveling; Planning of temporary services at the site; Safety precautions at construction sites; Security of materials at building site; Stages of inspection and quality control etc.

### 17. THEORY OF ARCHITECTURE

Understanding of the various theories and concepts of design and how philosophy, style and strategies are related to architecture of following periods. Pre Modern – Antonio Gaudi; Charles Rennie Mackintosh, Antonio Sant Elia; Adolf Loos; Auguste Perret, Peter Behrens; Bruno Taut, Gerrit Reitveld, Tatlin. Modern – Gropius, Mies Van der Rohe; Frank Lloyd Wright, Le Corbusier, Alvar Aalto, Terragni; Louis Kahn. Post Modern – Spatial/Deconstruction (Frank O Gehry, Michael Graves, Peter Eisenman, Moore, Richard Meier, Robert Venturi, Zaha Hadid, Coop Himmelblau, Richard Rogers, Tadao Ando, Rem Koolhaas, Herzog and de Meuron, Daniel Libeskind); Historicism (Michael Graves & Robert Venturi, Brno Tschumi); Urbanist (Mario Botta, Aldo Rossi, Cesar Pelli); Classicists (Arata Isozaki, Michael Graves, Mario Botta); Revivalists (Louis I Kahn, James Stirling, Charles Gwathmey, Richard Meier); Vernacular (Hasan Fathy); Philosophy (Charles Jencks, Bernard Tschumi, Peter Eisenman, John Hejduk); Critical Regionalism (Charles Correa, B.V. Doshi, Tadao); Materialist (Peter Zumthor) etc.

### 18. ARCHITECTURAL ACOUSTICS

Vocabulary of acoustics; Science of sound; Characteristics of audible sound – Propagation, Velocity, Frequency, Pitch, Quality/timbre, Loudness and Intensity; Behavior of audible sound in enclosures – Reflection, Absorption, Diffraction and Transmission of sound; Common acoustical defects and recommended remedies – Echo, Sound foci, Dead spots, Sound shadows, Resonance, Insufficient loudness, External noise and Reverberation; Sabine's expression for calculation of Reverberation time; Absorbents and absorption coefficient etc.; Noise control – Noise and its types; Noise pollution; Sources of indoor noise; Indoor noise levels; Planning and design against indoor noise; Sources of outdoor noise; Traffic noise levels; Planning and design against outdoor (traffic & buildings in built-up area) noise. Constructional measures for sound insulation of buildings – Materials, Hollow & composite wall construction, Floors & Ceilings; Properties of good acoustical materials. Sound system – Sound reinforcement system; Public address system; Sound system equipment e.g. Amplifiers, Microphones, Speakers, Mixers, Conference systems and accessories etc. Acoustical design principles and factors – Acoustical design principles for Auditoriums, Cinema halls, Conference rooms etc.; Factors e.g. Site selection & planning, Dimensions Shape, Seats & seating arrangements; Treatment of interior surfaces; Reverberation & sound absorption etc.

### 15. शैक्षिक विज्ञान

#### प्रश्नपत्र-1

#### 1. गणितीय भौतिकी

विमीय विश्लेषण, सदिश बीजगणित, सदिश कैलकुलस (गणना), प्रदिश (टैनसर) की अभिधारणा, प्रथम तथा द्वितीय कोटि के रेखीय सामान्य अवकल समीकरण, विशिष्ट फलन (लोलेजेन्डर, हर्माइट, बेसेल, लेगुंर), फूरियर श्रेणी, फूरियर तथा लाप्लास रूपांतर।

आंशिक अवकल समीकरण (लाप्लास, तरंग तथा उष्मा समीकरण द्वि तथा त्री विमीय) प्रारंभिक प्रायिकता सिद्धान्त, यादृच्छिक चर, द्विपद, पॉइसन तथा सामान्य वितरण, केन्द्रीय सीमा प्रमेय।

#### 2. विरसम्मत यांत्रिकी तथा द्रव्यों के गुण

न्यूटन के गति के नियम, कर्णों के निकाय तथा दृढ़ पिंड गतिकी, द्रव्यमान केन्द्र तथा गुरुत्व केन्द्र, ऊर्जा, संवेग तथा कोणीय संवेग के संरक्षण नियम, राकेट।

केन्द्रीय बल तथा इसके अभिलक्षण, कोपलर के ग्रह सम्बन्धी नियम, दो पिण्ड केन्द्रीय बल सम्बन्धी का लघुकरण, ग्रह तथा उपग्रह, कक्षीय तथा पलायन वेग, दूरसंचार उपग्रह। काल्पनिक तथा वास्तविक विश्वस्थान, डी-अलंबर्टस सिद्धान्त, सामान्यतः कृत निर्देशांक, लागरेन्डियन समीकरण, हैमिल्टोनियन के फलन तथा समीकरण, चक्रीय निर्देशांक, पॉइसन कोष्टक तथा कैनोनिकल रूपांतरण, हैमिल्टोनियन-जेकोबी सिद्धान्त, जड़त्वीय तथा अजड़त्वीय निर्देश तंत्र, घटना, गैलीलियन रूपांतरण, गैलीलियन निश्चरता तथा अनिश्चरता, आपेक्षिकता का विशिष्ट सिद्धान्त, लारेन्ज रूपांतरण, समकालिकता तथा समस्थानीयकता की आपेक्षिकता, लम्बाई संकुचन, समय वृद्धि (विस्तारण), वेग योग प्रमेय, अनापेक्षिकीय तथा आपेक्षिकीय कण, आपेक्षिकीय गतिकी, द्रव्यमान-ऊर्जा तुल्यता, प्रकाश में डालर प्रभाव।

भारयुक्त तार का प्रत्यास्थ व्यवहार, प्रत्यास्थता नियतांक, बेलन का एंडन, दण्डों का बंकन कैंटीलीयर, पुष्टतनाव, पृथ्वी ऊर्जा, सूर्य कोण, केशिकत्व, आधिक्य दाब, आदर्श तरल, द्रव्यमान, संवेग, ऊर्जा के संरक्षण पर आधारित जल गत्यात्मकता के समीकरण, श्यान बल (न्यूटन का नियम, वॉइजली का नियम, स्टीक का नियम)।

#### 3. उष्मागतिकी तथा सांख्यिकी भौतिकी

उष्मागतिकी के चार नियम तथा उनके परिणाम, कार्नों चक्र, उष्मा इंजन, फ्रिज(शीतकरी), उष्मागतिक विभव, मैक्सवेल के सम्बन्ध, जूल का प्रभाव, जूल-थॉमसन प्रभाव, गैसों में अभिगमन, पदार्थ का अणुगति सिद्धान्त, किरकोफ का नियम, घालन, संवहन, कृष्णिका विकिरण, प्लॉक का वितरण नियम तथा उससे स्टीफन नियम, वीन नियम तथा रेड-जॉस नियम का निगमन।

कला आकाश (μ और λ) स्थूल स्तर तथा सूक्ष्म स्तर, सूक्ष्म कैनोनिकल, गिब्स कैनोनिकल, ग्रैंड कैनोनिकल एन्सेम्बल तथा विभाजन जल।

विरसम्मत तथा बन्धन सांख्यिकीय यांत्रिकी, मैक्सवेल चाल वितरण, आदर्श बोस तथा फर्मी गैस, बोस-आइंस्टीन संघनन, उष्मागतिकीय तथा सांख्यिकीय एन्ट्रॉपी तथा प्रमेय, प्रथम तथा द्वितीय प्रावस्था संक्रमण।

#### 4. प्रकाशिकी तथा ध्वनिकी

काइनिन विन्दु (विद्युत्-चुम्बक), हाइड्रोजन तथा रेससड नेत्रिका, दृष्टिदोष, मानवनेत्र तथा कैमरा, दूरदर्शी तथा सूक्ष्मदर्शी, प्रकाश के सिद्धान्त, व्यतिकरण की अभिव्यक्ति तथा दशा, यंग द्विरिस्त, बाइप्रिज्म, पतली फिल्मों में रंग, न्यूटन बलय, माइकल्सन व्यतिकरणमापी, फ्रैन्की-पेरो व्यतिकरणमापी, फ्रेंजल तथा फ्राउनहोफर विवर्तन, जोन लेट, एकल रिस्त तथा बहुरिस्त विवर्तन, समतल ग्रेटिंग, ग्रेटिंग तथा प्रकाशिक उपकरण की विवेदन क्षमता, विवेदन की सीमा तथा मापदंड अच्युत तथा च्युति प्रकाश, कम्पन तल तथा ध्रुवन तल, परावर्तन, अपवर्तन, द्विअपवर्तन, द्विचरणता द्वारा ध्रुवन, मैलस का नियम, निर्यात प्रिज्म, मंदन पट्टिका (सदृश तथा चतुर्ताण) बेबिनेन प्रतिप्रकाश, ध्रुवन घूर्णन, ध्रुवनमापी। सम्बद्धता (कालिक तथा अकाशिक), उद्दीपित उत्सर्जन, उद्दीपित अवशोषण, स्वतः उत्सर्जन, आइन्स्टीन के तथा बी गुणांक, लेजर के घटक, प्रकाश, रूबीलेजर, He-Ne लेजर, अर्धचालक लेजर, हीलीयाग्रीषी तथा फोटोग्राफी, लेजर का चिकित्सा में उपयोग, आमन्दित, अमन्दित, प्रणोदित, अनुनाद कम्पन, लिसाजुस अकृति, ध्वनि का वेग, समतल प्रामी तथा अप्रामी तरंग, तनी-डोरी तथा आर्गन पाइप में कम्पन, सीमा पर परावर्तकता तथा पारगम्यता, कला वेग तथा समूह वेग।

#### प्रश्नपत्र-11

#### 5. विद्युत चुम्बकत्व

विद्युत पलकत्व, स्थिर वैद्युत में गाउस का नियम तथा उसके अनुप्रयोग, पैरा वैद्युत गोला तथा विद्युत द्विध्रुव के कारण विद्युत क्षेत्र तथा विभव, लान्सास तथा वॉइसन समीकरण, स्थिर चुम्बकत्व में गाउस का नियम, समान तथा असमान क्षेत्र में द्विध्रुव का व्यवहार, चुम्बकीय, रसायनिक तथा उष्मीय धारा का प्रभाव, बायो-सावर्ट का नियम तथा उसके अनुप्रयोग, एम्पियर-परिपथीय नियम तथा उसके अनुप्रयोग, लारेंज बल, साइक्लोट्रॉन (सीमा तथा संशोधन), धारामापी, अमीटर, वोल्टमीटर चुम्बकीय पलकत्व, विद्युत चुम्बकीय प्रेरण के नियम, स्थैतिक तथा गतिकीय प्रेरित विद्युत वाहक बल, स्वतः तथा अन्योन्य प्रेरण तथा प्रेरकत्व, स्थिर वैद्युत के नियम, स्थिर चुम्बकत्व के नियम, विद्युत चुम्बकत्व के नियम, सांतत्य का समीकरण तथा एम्पियर परिपथीय नियम में संशोधन, चालन तथा विस्थापन धारा, निर्वात तथा पैरा वैद्युत में मैक्सवेल के समीकरण, विद्युत चुम्बकीय तरंगें, प्लाज्मा में परिक्षेपण सम्बन्ध, प्रेषण लाइन, तरंग धक्का।

#### 6. क्वाण्टम यांत्रिकी

तरंग-कण द्वैतता, द्रव्य तरंगें, अनिश्चितता का सिद्धान्त, प्रकाश वैद्युत प्रभाव तथा कॉम्प्टन प्रभाव, डेब्रीजिन-जॉर्जर प्रयोग, तरंग पैकेट, ब्रॉडिन्जर समीकरण (काल आश्रित तथा काल अनाश्रित), तरंग फलन का गैतिक अर्थ, प्रसामान्यीकरण, लांबिकता, प्रसामान्य लांबिकता, आइंगनमान समीकरण, आइंगन मान, आइंगन फलन, प्रत्याशी मार, एह्रेन्फेस्ट प्रमेय, डिस्क फलन तथा क्रोनेकर डेल्टा एक वाक्य में कण, विभव सोपान, विभव प्राचीर, आवर्ती दोलित, दृढ़ घूर्णक, हाइड्रोजन परमाणु, गोलीय प्रसंवादी, क्रमविनियम तथा अक्रमविनियम सम्बन्ध, पाउली चक्रण आव्यूह, संकारक, विनियम अपभ्रष्टता।

#### 7. परमाण्वीय, आण्विक, नाभिकीय तथा कण भौतिकी

बोर तथा सोमर फ्रीड प्रारूप, हाइड्रोजन सद्रूप परमाणु नाभिकीय गति का प्रभाव, प्रकाशीय स्पेक्ट्रा तथा एक्स-किरण स्पेक्ट्रा, ड्युआन-हुट्ट का नियम, मोजलर का नियम, परमाणु का सदृश प्रारूप, बोर मैनीटान, लारमर आवृत्ति, स्टर्न-गैलर प्रमेय, वर्ण नियम, स्पेक्ट्री पद, L-S युग्मन, J-J युग्मन, सोडियम की D तथा D<sub>2</sub> रेखाएं, लेन्डे-μ गुणांक, जीमान प्रभाव (सामान्य तथा असामान्य), वासनेन बैक प्रभाव, स्टार्क प्रभाव, इलेक्ट्रॉनिक, घूर्णन, कम्पन आण्विक स्पेक्ट्रा, रमन प्रभाव, स्फुरदीप्ति प्रभाव, रेडियोसक्रियता के नियम, पृथ्वी तथा कार्बन दिनांकन, द्रव्यमान क्षति, संकुचन अनुपात, बन्धन ऊर्जा, बन्धन ऊर्जा बक्र, नाभिकीय विखण्डन, नाभिकीय संलयन, नाभिकीय रियेक्टर, नाभिकीय अभिक्रिया, Q-मान, श्रुंखला अभिक्रिया (नियन्त्रित तथा अनियन्त्रित), ताप-नाभिकीय अभिक्रिया, हाइड्रोजन बम, अर्ध-द्रव्यमान सूत्र, द्रव्य ब्रूंद प्रारूप, कोश प्रारूप, सामूहिक प्रारूप (मॉडेल), नाभिकीय बल, मूल कण, चार मूल अन्व्योय क्रिया, चक्रण, द्रव्यमान तथा अन्व्योय क्रिया पर आधारित प्रारम्भिक कणों का वर्गीकरण, प्रारम्भिक कणों के क्वाण्टम संख्या (आवेश, चक्रण, समचक्रण, अप्रत्याशित), क्वाक प्रारूप, बेरिऑन, लेपटोन, मेसॉन, संरक्षण नियम।

#### 8. इलेक्ट्रॉनिकी तथा संचालित प्रवृ

आन्तर तथा बाह्य अर्धचालक, P-N संधि और जेनर डायोड तथा उनके अभिलक्षण, दिष्टकारी तथा फिक्टर द्विध्रुवीय तथा एक ध्रुवीय ट्रांजिस्टर, निवेशी तथा निर्गत अभिलक्षणिक बक्र, संकर प्राचल, लाम (प्रतिरोध, धारा, वोल्टेज शक्ति), वोल्टेज तथा शक्ति प्रवर्धक, पुनः निवेश प्रवर्धक, प्रचलन प्रवर्धक, दोलित मॉड्युलर, संसृचक, पारम्पानिक परावर्धक (उत्पादन, संसृचन तथा अनुप्रयोग), मल्टीमीटर, कैथोड किरण कम्पनदर्शी (CRO), प्रकाश इलेक्ट्रॉनिक युक्ति (प्रकाश उत्सर्जक डायोड, प्रकाश संसृचक, प्रकाश ट्रांजिस्टर, सोलर सेल)।

एनर्गोली तथा डिजिटल सिग्नल, तर्क द्वार (NOT, AND, OR, NAND, NOR, XCR, XNOR) तथा उनके रिवचन परिपथ, तर्क प्रतीक, सत्य सारणी, वेन आरेख, बूलियन फलन, K-मैप, योजक तथा व्यवकलक, बूलियन प्रमेय, A/D (एनर्गोली से डिजिटल), D/A (डिजिटल से एनर्गोली), रेडिस्टर, काउन्टर (गणक), तुल नित्र, फिलप-फ्लॉप, माइक्रो प्रोसेसर (सूक्ष्म गणक), ब्रेवाइस जालक, व्यूकम जालक, इलेक्ट्रॉन विवर्तन, टोर्स में बंधन, द्रवक्रियक, टोर्स को लिए एवम्बत इलेक्ट्रॉन तथा बैन्ड सिद्धान्त, आवर्ती विभव में इलेक्ट्रॉनों की गति, स्वतन्त्र इलेक्ट्रॉन तथा कोटर का प्रामापी द्रव्यमान, टोर्स की विशिष्ट उष्मा (थिर्ससमत तथा ब्यान्ड सिद्धान्त), हाल का प्रभाव तथा तापीय-विद्युत शक्ति, अतिचालकता (टाइप-1 तथा टाइप-2), अतिचालक, जोसेफसन संधि, BCS सिद्धान्त, कूपर युग्म, अतितरलता, प्रति, अनु, लौह, प्रति लौह, फेरी (लघु लौह), चुम्बकत्व।

#### 16. रसायन

#### प्रश्नपत्र-12

#### अकार्बनिक रसायन

बोर का सिद्धान्त तथा इसकी सीमायें, डि-ब्रौलीकी समीकरण, हाइड्रोजन वक्र का अनिश्चितता का सिद्धान्त, पाउली का उपवर्जन का सिद्धान्त, हुण्ड का अधिकतम बहुलता का नियम, आफ्फाऊ के नियम, ब्लैंक का क्वाण्टम सिद्धान्त, तरंग कण द्वैती प्रकृति, ब्रॉडिन्जर तरंग समीकरण, कोणीय संवेग, इलेक्ट्रॉनिक ऊर्जाओं का क्वाण्टीकरण, हाइड्रोजन परमाणु का गुणात्मक विवरण परमाणुओं के गुणों में आवर्तता- परमाणु तथा आयनिक त्रिध्रुवयें, आयनन विभव, इलेक्ट्रॉन बन्धुता, विद्युत-ऋणात्मकता, हाइड्रोजन ऊर्जा, जालक ऊर्जा। रासायनिक आबंध- संयोजी आबंध सिद्धान्त, संकरण, संयोजी कोष, इलेक्ट्रॉन युग्म प्रतिकर्षण सिद्धान्त, आण्विक कक्षा सिद्धान्त, सम एवं विषम नाभिकीय द्विपरमाणु अणुओं के आण्विक कक्षा चित्र। S तथा p कक्षा के तत्वों के साधारण गुण। नाभिकीय परिवर्तन का रासायनिक प्रभाव, नाभिकीय विखण्डन तथा संलयन। रेडियोसक्रिय आयसोटोप तथा उनके अनुप्रयोग। आक्सीकरण तथा अपचयन, आक्सीकारक तथा अपचयकार एजेन्ट्स, रिडायस अभिक्रियाओं का संतुलन। अम्लों तथा क्षारों की अवधारणा- ब्रॉस्टेड-लारी सिद्धान्त, अम्लों तथा क्षारों का लुईस की अवधारणा, कठोर तथा कोमल अम्ल एवं क्षार। बहुलक- बहुलकों की परिभाषा तथा उनका वर्गीकरण, पालीएथिलीन एवं पालीविनाइल क्लोराइड के विशेष संदर्भ में बहुलकों के गुण। प्रदूषक तथा वातावरण पर इसका प्रभाव, रासायनिक टाक्सिकोलाजी। सममित तथा समूह सिद्धान्त- सममित तत्व तथा सममित प्रचालन। समूह तथा उप समूह की परिभाषा, बिन्दु सममित तथा समूह निर्धारण निम्नलिखित अणुओं में- NH<sub>3</sub>, H<sub>2</sub>O, PCl<sub>5</sub>, XeF<sub>4</sub>। ट्रांजीशन तत्वों के रसायन- साधारण गुण, परिवर्तनीय आक्सीकरण अवस्था, रंग, कम्प्लेक्स की संरचना, चुम्बकीय तथा उत्प्रेरकी गुण। लेन्थानाइड्स तथा एक्टिनाइड्स के रसायन- लेन्थानाइड्स शिफ्ट, आक्सीकरण अवस्थायें, स्पेक्ट्रल एवं चुम्बकीय गुण, पृथक तथा विद्योचन करने का सिद्धान्त। समन्वय रसायन- कम्प्लेक्स यौगिकों का I.U.P.A.C. नामकरण, समावयवता, संयोजी बन्ध सिद्धान्त तथा इसकी सीमायें। क्रिस्टल क्षेत्र सिद्धान्त- d-कक्षाओं के विभाजन अर्धफलकीय एवं चतुष्फलकीय कम्प्लेक्स में, सी, एफ, इस्, तथा ट्रांजीशन धातु के आयनों के रंग एवं चुम्बकत्व। अणुफलकीय कम्प्लेक्स के दुर्बल एवं प्रबल क्षेत्र। स्पेक्ट्रोसायन श्रृंघी नेफीलासंसेटिक श्रृंघी, d-कक्षा के तत्वों के इलेक्ट्रॉनिक स्पेक्ट्रा, कम्प्लेक्सेशन, आरगेरल चित्र, इलेक्ट्रॉनिक ट्रांजीशन के सेलेक्शन नियम, d1 से d9 तक के लिये स्पेक्ट्रोकोपिक ग्राउन्ड स्टेट्स। प्रमुख समूह तत्व तथा उनके रसायन- नाइट्रोजन, फास्फोरस एवं गंधक के आक्सीअम्ल, इन्टरहेलोचन तथा सिडोहेलाइड्स, नोड्युल गैस यौगिक, बोरेन्स, कार्बोरेन्स, बोराजिन्स तथा फास्फाजिन्स, सिलिकेट्स तथा सिलिकन्स। कार्बायनिक रसायन- संश्लेषण, कार्बायनिक यौगिकों की संरचना तथा नामकरण। समांगी उत्प्रेरकी अभिक्रियायें, पाई-अम्ल धातु कम्प्लेक्स। बायोअकार्बनिक तथा सुप्राआण्विक रसायन- बायोलाजिकल प्रक्रिया में आवश्यक तथा द्रूस तथा, हेमोग्लोबिन तथा मायोग्लोबिन, Ca<sup>2+</sup> के विशेष संदर्भ में अल्कलाइन तथा अल्कलाइन अर्थ धातुओं का बायोलाजिकल भूमिका। प्रकाश संश्लेषण तथा नाइट्रोजन निर्धारण। सुप्राअणुओं का परिचय तथा नामकरण। आण्विक पहिचान तथा कैरियर सिद्धान्त।

#### भौतिक रसायन

टोर्स अवस्था रसायन- टोर्सों का क्रिस्टलाइन अवस्था, यूनिट सेल, ब्रेमाइस जालक, मिलर इन्डिसेज, क्रिस्टलीय टोर्सों द्वारा एक्स-रेयु का विवर्तन, क्रिस्टल दोष तथा नॉनस्टोचियोमेट्री। शुद्ध तथा अशुद्ध क्रिस्टल, फ्रेन्केल तथा स्काट्टी दोष। टोर्सों के गुण, आयनिक चालकता तथा विररण एवं फेरोइलेक्ट्रिक गुण। इलेक्ट्रॉनिक गुण तथा बैंड सिद्धान्त- धातुओं का बैंड संरचना, समीचालक (एक्सट्रिन्सिक तथा इन्ट्रिन्सिक), n-p-जंक्शन, सुपर चालक। प्रुठ परिघटना- प्रुठ तनाव, टोर्सों पर अधिशोषण, इलेक्ट्रो-गैतिकी सहित इन्टरफेसों पर इलेक्ट्रिकल परिघटना, मिसेल तथा उत्क्रम मिसेल।

रासायनिक साम्य- ली-शेटियर सिद्धान्त तथा इसका अनुप्रयोग। उष्मागतिकी- उष्मागतिकी का प्रथम नियम, स्थिर आयतन एवं दाब पर उष्माधारिता तथा इनमें संबंध, जूल-थामसन गुणांक, उल्कमणीय प्रक्रम के लिये आयसोथर्मल तथा एडियाबैटिक अवस्था में आदर्श गैसों के विस्तारण में W, q, du, dh की गणना। उष्मा समेपन में हेस का नियम तथा इसका अनुप्रयोग। स्थिर दाब एवं आयतन पर अभिक्रिया की ऊष्मा, उदासीनीकरण की एन्थैल्पी, आबंध ऊर्जा तथा ऊष्मीय रसायन आंकड़े से इसकी गणना। उष्मागतिकी का दूसरा नियम- गिब्स (G) तथा हेल्महोल्ट्ज (A) फंक्शन्स, उष्मागतिकीय राशियाँ, P, V तथा T परिवर्तन के साथ G तथा A में परिवर्तन। कानों चक्र तथा इसकी क्षमता। एन्ट्रापी की अवधारणा, मुक्त ऊर्जा तथा मिश्रित करने की एन्ट्रापी, आंशिक मोलर राशियाँ, गिब्स-ड्यूहेम समीकरण, एक तथा दो घटकों वाले निकाय का प्रावस्था चित्रण तथा प्रावस्था नियम। आदर्श गैसों में परिवर्तन तथा गैसों के मिश्रण। उष्मागतिकी का तीसरा नियम- कथन तथा अभिव्यक्ति।

स्पेक्ट्रोस्कोपी- समग्र आधारित अवस्थाएँ तथा स्पेक्ट्रोस्कोपी, विकिरण का अवशोषण तथा उत्सर्जन तथा सेलेक्शन के नियम, लाइन का आकार तथा चौड़ाई।

चुम्बकीय अनुनाद स्पेक्ट्रोस्कोपी- सिद्धान्त तथा इसके अनुप्रयोग, रासायनिक विस्थापन तथा स्पीन-स्पीन कपलिंग, A<sub>3</sub>, X, AX, and AMX निकाय का प्रथम क्रम का स्पेक्ट्रा। द्वितीय परमाणु अणुओं का इलेक्ट्रॉनिक स्पेक्ट्रोस्कोपी, धूर्णी महीन अणु।

आई आर स्पेक्ट्रोस्कोपी, सममित गुण तथा नाभिकीय स्पीन प्रभाव, रमन प्रभाव, पालीपरमाणु अणुओं का कम्पन। इलेक्ट्रोसायन- डिवाइड ह्यूकेल के आयन-आयन पारस्परिक क्रिया तथा सक्रियता गुणांक का गुणात्मक विवरण, द्विस्तरीय की उष्मागतिकी, चालकता आकड़ों से संतुणन स्थिरांक (K<sub>a</sub>) को ज्ञात करना। इलेक्ट्रोसायनिक वेग-स्थिरांक के मापन में उपयोग।

#### प्रश्नपत्र-11

#### कार्बनिक रसायन

स्टीरियो रसायन-सममिति के तत्व, किरल तथा अकिरल अणु, R तथा S (आर तथा एस) नामकरण, एसाइक्लिक यौगिकों में डाइऑरिस्टियोमरीसी। एसेमेट्रिक संश्लेषण की विधियाँ। स्टीरियोसिन्थेस तथा स्टीरियोसेलेक्टीव अभिक्रियाएँ। विश्वर का इन्टरकनवर्जन, न्यूटन साहोसं प्राजोवैशन्स, ई, जेड समावयवता, मानो तथा डाई संभिट्टेटेड साइक्लोहेक्सेन्स का कानफार्मेशनल विश्लेषण। एसाइक्लिक यौगिकों तथा साइक्लोहेक्सेन्स में अभिक्रियाशीलता पर संतुष्टि का प्रभाव।

न्यूक्लियॉफिलिक एरोमेटिक सब्स्टीट्यूशन - एरोमेटिक SN1 तथा SN2 क्रियाविधि, लिविंग समूह तथा आक्रामक न्यूक्लियॉफाइल, पड़ोसी समूह के शामिल होने के प्रमाण, क्लासिकल बनाम नानक्लसिकल कार्बोनिम आयन-इस समूह से स्टेट्स। कार्बन-कार्बन मल्टीपुल बन्धों में युग्, इलेक्ट्रोफिलिक, मुक्तरिडिकल तथा न्यूक्लियोफिलिक योग। इन्स्टीरिफिकेशन तथा इस्टर्स के जल अपवहन; चतुष्फलकीय इन्टरमीडिएट के प्रमाण, BA<sub>2</sub> तथा AAC<sub>2</sub> क्रियाविधि तथा इलीमिनेशन अभिक्रिया। E1, E2 तथा E-<sub>2</sub> क्रियाविधि, हाफमैन बनाम सेतेजेफ इलीमिनेशन, इलीमिनेशन तथा सब्स्टीट्यूशन अभिक्रियाओं में प्रतियोगिता। कॉर्नन कार्बनिक अभिक्रिया तथा क्रियाविधि एलडोल, डीकमन संघनन, रिफार्मट्सकी, बेन्जोईन, वीटिंग, रीमर-टीमान, डील्स-एल्डर, रॉविन्सन एनुलेशन, एनि बार्टन अभिक्रिया, हॉफमैन-लोफर-फ्रेटज अभिक्रियायें, शीफेर अभिक्रिया, शार्पलेस इपाक्सीडेसन अभिक्रिया, मार्निंग अभिक्रिया, माइकेल अभिक्रिया, स्ट्रोकरएनमिना अभिक्रिया, स्टेटर अभिक्रिया तथा बेल्सि-हिलमान अभिक्रिया।

रिआरन्ग्मेन्ट्स- पीनाकोल-पीनाकोलोन, वेगनर-मीरवाइन, डेमजाजोव, बेकमन, हॉफमन, कूटरियस, स्कमीडट, लॉरेन्स, सोनरलेट-हाउजर, फेवोरोस्की तथा बेयर-वीलीगर रिआरंजमेंट। कार्बनिक संश्लेषण - किसी मोनोसब्स्टीट्यूटेड बेन्जीन या डीनोस से ही किसी डाई तथा ट्राई-सब्स्टीट्यूटेड बेन्जन व्युत्पन्नों का संश्लेषण। C-C बन्ध का उपयोग करने वालों जिसमें वीटिंग, वीटिंग हानर, गिलमन एनिकर्मक, आरगोनीलिवियम, ग्रिगनार्ड्स, रॉविन्सन एनुलेशन, डीकमन संघनन, नोवेनाजेल, मानिन्स, स्टार्क अभिकर्मक तथा विष्मैरर अभिक्रियाओं तथा उमगोलंग (1,3-dithiane) शामिल हों, उनका उपयोग साधारण यौगिकों के संश्लेषण में। स्वन आक्सीकरण, बीच वॉल्फ किशन तथा धातु के हाइड्राइड अपचयनों को प्रयोग में लेते हुये संश्लेषण रूपान्तरण एवं उत्प्रेरकी हाइड्रोजनेशन तथा ट्राईयूटिलडीन हाइड्राइड, ट्राईमैथिलसिलिल आयोडाइड, एल डी ए, N-ब्यूटिल, रेनी नीकेल, एन बी एस, क्रोमियम जैसे अतिकर्मक, डी सी सी तथा Pd, जैसे अतिकर्मक का प्रयोग करते हुडे संश्लेषण रूपान्तरण। मल्टीस्टेप संश्लेषण में प्राटोविव समूह (एलिडहाइड्रस, किन्टिन तथा कार्बाक्सिलिक अम्ल) के अनुप्रयोग की अवधारणा। आई आर (फंक्शनल समूह), पी एम आर तथा सी एम आर एवं मास स्पेक्ट्रा (साधारण अणु के) द्वारा कार्बनिक इन्टरमीडिएट की स्पेक्ट्रल पहचान।

विषय चक्रीय रसायन :- विषय चक्रीय वे यौगिक को पाँच या छः सदस्य के रिंग वाले होते हैं-पायरसोल्स, इमीडाजोल्स, पिरीडीन तथा वकीनोलेन। विषय चक्रीय यौगिकों के अनुप्रयोग-कैफिन, डीयाजोपेन तथा किनोथियाजिन्स।

पेरिसाइक्लिक अभिक्रियायें - वर्गीकरण तथा उदाहरण, हॉफमन का नियम, इलेक्ट्रोसाइक्लिक अभिक्रिया, साइक्लोपेडिशन अभिक्रिया (2+2) तथा (4+2) केवल एवं सिग्माट्रोपिक विस्थापन (1, 3) विस्थापन, (1, 5) विस्थापन तथा (3, 3)-विस्थापन (कोप रिआरंजमेंट एवं वलेजेन रिआरंजमेंट) एक.एम.ओ. के द्वारा केवल। एरोमेटिक यौगिक अभिक्रिया - प्रकाश रसायन प्रक्रियायें, जायलोन्सकी चित्रण, एक्ससीलेक्सेज, प्रकाश रासायनिक एडिशन प्रक्रिया। डाइमरीजेन्स, कार्बनिल यौगिकों का प्रकाश रसायन, नर्वीश टाइप-1 तथा नर्वीश टाइप-1। साइक्लिक एवं असाइक्लिक क्लेटोनों के। पैटर्नो-युक्ती अभिक्रिया, प्रकाश अपचयन, B, Y, अस्तुव क्लेटोन्स, साइक्लोहेक्सेनोन्स तथा 2,5 साइक्लोहेक्साडाइनोन्स के द्वारा दिये गये रिआरंजमेंट, एरोमेटिक यौगिकों का प्रकाश रसायन, स्कोलेटल आयसोमरीजेन्स।

प्राकृतिक उत्पत्ती का रसायन - टर्पिन तथा एकोलाइड्स, विटामिन्स तथा हार्मोन्स, वसा में घुलनशील विटामिन्स तथा जल में घुलनशील विटामिन्स का परिचय। विटामिन A, D, E, K, विटामिन B कॉम्प्लेक्स तथा विटामिन C के फंक्शन्स। थाइराइड हार्मोन्स (थाइराक्सीन) के विशय संदर्भ में, हार्मान्स के परिचय, वर्गीकरण तथा गुणों का विवरण।

जीवन प्रक्रिया के अणु - शक्कर, डी एन ए तथा आर एन ए, एन्जाइम्स-इनकी परिभाषा, वर्गीकरण तथा इनके अनुप्रयोग।

#### 17. ENGLISH

#### PAPER-I : English Grammar

1. Comprehension
2. Spelling Rules
3. Articles
4. Parts of Speech
5. Tenses
6. Active and Passive Voice
7. Direct and Indirect Speech
8. Question Tag
9. Simple, Complex and Compound Sentences
10. Transformation of Sentences
11. Synthesis of Sentences
12. Correct Usage
13. Infinitive, Gerund and Participle
14. Vocabulary : Antonyms, Synonyms, One Word Substitution, Homophones and Homonyms
15. Idioms and Phrases
16. Word Formation
17. Preposition
18. Auxiliaries and Modals
19. Comparison of Adjectives
20. Figures of Speech

**PAPER-II : English Literature**

**A – Major Authors and Their Works**

1. Geoffrey Chaucer
2. Christopher Marlowe
3. Francis Bacon
4. William Shakespeare
5. John Milton
6. Alexander Pope
7. John Dryden
8. William Wordsworth
9. P.B. Shelley
10. John Keats
11. Charles Lamb
12. Jane Austen
13. Alfred Tennyson
14. Matthew Arnold
15. Thomas Hardy
16. Charles Dickens
17. W.B. Yeats
18. T.S. Eliot
19. G.B. Shaw
20. John Galsworthy
21. Kamala Das
22. Nissim Ezekiel
23. Robert Frost
24. Walt Whitman
25. William Faulkner

**B – Literary Criticism**

1. Aristotle
2. John Dryden
3. William Wordsworth
4. S.T. Coleridge
5. Matthew Arnold
6. T.S. Eliot

**C – Literary Forms and Movements**

**18. MATHEMATICS**  
**PAPER-I**

**1-Real Analysis :**

Functions of Several variables: Euclidian spaces, continuous functions, derivatives in an open subset of  $R^n$ , Chainrule, Partial derivatives, interchange of order of differentiation, Derivatives of higher orders, Taylor's theorem, Inverse function theorem, implicit function theorem.

Lebesgue outer measure, Measurable sets, Measurable functions, Borel and Lobesgue measurability.

Integration of non-negative functions, Integration of series, Riemann and Lebesgue integrals.

Functions of Bounded variation.

Measure and outer measure Extension of a measure, Uniqueness of extension, Completion of a measure, Measure spaces, Integration with respect to a measure. The  $L_p$ -spaces, Convex functions, Jensen's inequality, Holder and Minkowski inequalities, Completeness of  $L_p$ , Convergence in measure.

**2-Complex Analysis:**

Cauchy-Goursat theorem, Poisson integral formula, Cauchy's integral formula for derivatives, Cauchy's inequality, Liouville's theorem, Morera's theorem, Taylor's and Laurent's theorems, Maximum modulus principle, Schwarz lemma, Meromorphic functions, Inverse function theorem.

Residues, Cauchy's residue theorem, Evaluation of integrals.

Weierstrass factorization theorem, Gamma function, Riemann zeta function, Mittag-Leffler's theorem, Riemann mapping theorem.

Analytic continuation, Uniqueness of analytic continuation along a curve, Power Series method of analytic continuation, Natural boundary, Schwarz reflection principle. Harnack's inequality and theorem.

Canonical products, Jensen's formula, Hadamard's three circles theorem, Order of an entire function, Exponent of convergence, Borel's theorem, Hadamard's factorization theorem.

**3-Topology :**

Completeness of metric spaces, Cantor's Intersection theorem, Dense sets, Baire's category theorem, Separable spaces, Continuous functions, Uniform continuity, Isometry and homeomorphism, Compactness, Sequential compactness, Totally bounded spaces, Finite intersection property.

Definition and examples of topological spaces, Neighbourhoods, Closed sets, Limit point and derived sets, Closure, interior, exterior and boundary of a set, Dense and nowhere dense sets, Bases and sub-bases, Subspaces and relative topology, Metric topology and equivalent metrics.

Characterization of topology in terms of Kuratowski closure operator and fundamental system of neighbourhoods.

Continuous maps and homeomorphisms.

First and second countable spaces, Lindelof's theorem, Separable spaces.

Separation axioms,  $T_0$ ,  $T_1$ ,  $T_2$ ,  $T_3$  Tychonoff ( $T_3/2$ ) and  $T_4$  spaces Urysohn's lemma, Tietze extension theorem.

Compactness, Continuous functions and compact sets.

Connected spaces, connectedness on the real line, components, Locally connected spaces.

Tychonoff product topology, projection maps, separation axioms and product spaces, connectedness and product spaces, compactness and product spaces, countability and product spaces.

**4. Rigid Dynamics :**

Moments and product of inertia, momental ellipsoid, Equipmental systems, Principal axes. D'Alembert's principle, General equations of motion of a rigid body, Motion of the centre of inertia and motion relative to the centre of inertia.

Motion about a fixed axis, Compound pendulum,

Motion of rigid body in two dimensions under finite and impulsive forces. Conservation of momentum and energy, Lagrange's equation, Euler's equations of motion, Hamilton's principle, Hamilton's equations of motion.

**5.Calculus of Variations :**

**Variational problems with fixed boundaries** – Euler's equation for functionals containing first order derivative and one independent variable, functionals dependent on higher order derivatives, functionals dependent on more than one independent variable, variational problems in parametric form, Invariance of Euler's equation under coordinate transformation.

**Variational problems with moving boundaries** : Functionals dependent on one and two functions, one sided variations.

**Sufficient conditions for an extremum** : Jacobian and Legendre conditions, Second variation, Variational principle of least action.

**6.Discrete Mathematics:**

**Formal Logic** – Statements, symbolic Representation and Tautologies, Quantifiers, Predicates and Validity, Propositional Logic.

**Semigroups and Monoids** – Definitions and Examples, Homomorphisms of Semigroups and Monoids, congruence relation and Quotient Semigroup, Subsemigroup and sub-monoids, direct products, basic homomorphism theorem.

**Lattices** – Lattices as partially ordered sets, their properties, Lattices as Algebraic system, Sub-lattices, direct product and Homomorphisms, complete, complemented and Distributive Lattices.

**Boolean Algebras** – Boolean Algebras as Lattices, Various Boolean Identities, switching algebra example, Sub-algebras, Direct products and Homomorphisms, Join-irreducible elements, Atoms and Minterms, Boolean forms and their equivalence, Minterm Boolean forms, sum of products, Canonical Forms, Minimization of Boolean Functions, Applications of Boolean Algebra to switching theory, the Karnaugh Map Method.

**Graph Theory** – Definition of Graphs, Paths, Circuits, Cycles and Subgraphs, Induced Subgraphs, Degree of a vertex, Connectivity, Planar Graphs, trees, Euler's formula for connected planar graphs, complete and complete Bipartite Graphs, Kuratowski's theorem and its use,

Spanning trees, matrix representation of graphs, Euler's theorem on the existence of Eulerian Paths and circuits, directed graphs, Indegree and Outdegree of vertex, Weighted undirected Graphs, directed trees, search Trees, Tree Traversals.

**7.Mathematical Statistics:**

Moments, method of least squares and curve fitting, moments of bivariate distribution, correlation coefficient and regression, partial and multiple correlation for three variables.

**Probability** : Axiomatic definition of probability, Independent events, Baye's theorem, discrete and continuous random variables.

**Probability distribution functions** : Binomial, Poisson's and normal probability distributions. Chi square distribution, t-, f- and z- distributions.

**PAPER-II**

**1. Abstract Algebra :**

**Groups**- Normal and subnormal series, composition series, Jordan-Holder theorem, Solvable groups, Nilpotent groups, p-Sylow subgroups, Cauchy's theorem. Conjugacy relation, Class equation, Direct product, Sylow theorems, Structure theorem for finite abelian groups.

**Rings**- Integral domain, Imbedding theorem, prime and maximal ideals, Quotient rings, Euclidean rings, Polynomial rings, Gaussian rings, unique factorization theorem.

**Modules**- Modules and submodules, quotient module, Isomorphism theorem, cyclic modules, simple modules, semi-simple modules, Sehuler's Lemma, Free modules.

**Field Theory**- Extension fields, algebraic and transcendental extensions separable and inseparable extensions, normal extensions, perfect fields finite fields, Primitive elements, Algebraically closed fields, Automorphisms of extensions, Galois extensions, fundamental theorem of Galois theory solution of polynomial equations by radicals.

**Canonical Forms**- Similarity of linear transformations, Invariant subspaces reduction to triangular forms, Nilpotent transformations, Index of nilpotency, Invariants of a nilpotent transformation, The primary decomposition theorem, Jordan blocks and Jordan forms.

**2. Fluid Dynamics :**

**Kinematics**- Lagrangian and Eulerian method, Equation of continuity, Boundary surface, Stream lines, Path lines and streak lines, Velocity potential, Vortex line, Rotational and irrotational motion.

**Equation of motion**- Euler's and Lagrange's equation of motion, Bernoulli's equations, Equation of impulsive action.

**Motion in two dimensions**- Sources and Sinks, stream or current function, Complex potential, Doublets, Images Milne-Thomson circle theorem, Theorem of Blasius, Flow and circulation, Kelvin's circulation theorem, Performance of irrotational motion, Kinetic energy of infinite liquid.

**Motion of cylinders**- General equation of cylinder, Kinetic energy, Motion of circular and elliptic cylinders, Liquid streaming past a fixed circular/elliptic cylinder, Kinetic energy of elliptic cylinder.

**Motion of Spheres**- Motion of a sphere through liquid at rest of infinity, liquid streaming past a fixed sphere, Equation of motion of a sphere, Stoke's stream function.

**3. Functional Analysis :**

Normed linear spaces, Banach spaces, Continuous linear transformations, spaces of continuous linear transformations from a linear space to a Branch space, Continuous linear functionals.

Hahn-Banach theorem for real linear spaces, complex linear spaces, and normed linear spaces, Natural imbedding of  $N$  in  $N^{**}$ , open mapping theorem, closed graph theorem, conjugate of an operator, Banach-Steinhaus theorem, Uniform boundedness theorem and some of its consequences.

Conjugate spaces, Weak of weak\* topologies on conjugate space, Simple applications to reflexive separable spaces and to the calculus of variations.

Hilbert spaces, Schwarz's inequality, Orthogonal complement of a subspace, Orthonormal sets, Bessel's inequality, Continuous linear functionals, Riesz representation theorem, Reflexivity of Hilbert spaces, adjoint of an operator, self-adjoint operators, normal and unitary operators, Projections.

Finite dimensional spectral theory: Determinant and the spectrum of an operator, the spectral theorem.

**4. Integral Equations :**

Definition and classification of integral equations.

Fredholm integral equation of the second kind with separable kernel, reduction to a system of algebraic equations. Method of successive approximations, iterative scheme for Fredholm integral equation of second kind, condition of uniform convergence and uniqueness of series solution, resolvent kernel, Eigen values and eigen functions, Classical Fredholm theory.

Conversion of differential equations into integral equations, initial value problems, application of iterative scheme to Volterra integral equation of second kind, method of successive approximations for Volterra integral equations.

**Integral transform methods :**

<p>Fourier transform, Laplace transform, convolution integral, application to Volterra integral equations with convolution type kernels.</p> <p><b>Symmetric kernels:</b> Complex Hilbert space, Orthonormal system of functions, Fundamental properties of eigen values and eigen functions for symmetric kernels, Hilbert-Schmidt theorem and its immediate consequences, solution of integral equations with symmetric kernels.</p> <p><b>5. Partial Differential Equations :</b> Nonlinear partial differential equations of the first order, Cauchy's method of characteristics, Compatible systems of first order equations, Charpit's method, Special types of first order equations, solutions satisfying given conditions, Jacobi's method. Partial differential equations of the Second order with variable coefficients, Canonical forms, Separation of variables, Nonlinear equations of the second order-Monge's method, Laplace equation, wave equation and diffusion equation.</p> <p><b>6. Analytical Dynamics :</b> Generalized coordinates, Holonomic and non-holonomic systems, Scleromic and rheonomic systems, generalized potential, Lagrange's equations, uniqueness of solution, Energy equation for conservative fields.</p>	<p>Hamilton's canonical equations, Cyclic coordinates, Routh's equations, Poisson Brackets, Poisson Identity, Jacobi-Poisson theorem. Shortest distance, Minimum surface of revolution, Brachistochrone problem, Isoperimetric Problems.</p> <p>Hamilton's principle, Principle of least action, Poincare Cartan integral invariant, Hamilton-Jacobi equation, Lagrange's brackets. Invariance of Lagrange's brackets and Poisson brackets under canonical transformations.</p> <p><b>7. Operations Research :</b> Operations research and its scope, Necessity of operations research in industry.</p> <p><b>Linear Programming :</b> Simplex method, Big-M Method, Duality and sensitivity analysis. Transportation and Assignment problems.</p> <p><b>Game Theory:</b> Two-Person zero-sum games, Games with mixed strategies, Graphical solution, solution by linear programming.</p> <p><b>Sequencing Models:</b> Assumptions for sequencing problem, Processing n jobs through two machines, Processing n jobs through three machines, Processing two jobs through m machines.</p> <p><b>Network Analysis :</b> Construction of a network diagram. PERT and CPM, Time estimates in PERT, Project Crashing.</p>
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**परिशिष्ट - 4**

**उ0प्र0 प्राविधिक शिक्षा (अध्यापन) सेवा परीक्षा-2025**

विषयवार व श्रेणीवार रिक्तियों तथा दिव्यांगजन की चिन्हांकित उपश्रेणियों का विस्तृत विवरण

क्र0सं0	विषय का नाम	रिक्त पदों की संख्या	अनारक्षित	अनु. जाति	अनु.ज. जाति	अ.पि. वर्ग	ई. डब्ल्यू. एस.	स्व.सं. से.	दिव्यांगजन	भू पू.सं.	महिला
1	2	3	4	5	6	7	8	9	10	11	12
1.	यांत्रिक अभियंत्रण	140	48	39	02	37	14	02	05 (एल0वी0-01, एच0एच0-01, एल0सी0-01, डी0डब्ल्यू0-01, ए0ए0वी0-01)	07	28
2.	विद्युत अभियंत्रण	52	12	15	00	20	05	01	02 (एल0वी0-01, एच0एच0-01)	02	10
3.	सिविल अभियंत्रण	62	20	11	02	23	06	01	02 (एल0वी0-01, एच0एच0-01)	03	12
4.	इलेक्ट्रॉनिक्स अभियंत्रण	77	18	21	00	31	07	01	03 (एल0वी0-01, एच0एच0-01, एल0सी0-01)	03	15
5.	केमिकल अभियंत्रण	14	05	03	00	05	01	00	00	00	02
6.	कम्प्यूटर	43	14	11	00	14	04	00	01 (एल0वी0-01)	02	08
7.	पेंट टेक्नालॉजी	03	03	00	00	00	00	00	00	00	00
8.	प्लास्टिक मोल्ड टेक्नालॉजी	01	01	00	00	00	00	00	00	00	00
9.	टेक्सटाइल टेक्नालॉजी	04	00	01	00	03	00	00	00	00	00
10.	फुटवियर	03	01	01	00	01	00	00	00	00	00
11.	टेक्सटाइल केमिस्ट्री	01	01	00	00	00	00	00	00	00	00
12.	लेदर टेक्नालॉजी	01	01	00	00	00	00	00	00	00	00
13.	इंस्ट्रुमेंटेशन एण्ड कंट्रोल	01	00	01	00	00	00	00	00	00	00
14.	कर्मशाला अधीक्षक	10	05	01	00	03	01	00	00	00	02
15.	वास्तुकला (आर्किटेक्चर)	06	02	01	00	03	00	00	00	00	01
16.	भौतिकी	24	11	06	00	05	02	00	00	01	04
17.	रसायन	21	11	04	00	04	02	00	00	01	04
18.	अंग्रेजी	18	08	03	00	06	01	00	00	00	03
19.	गणित	32	15	06	00	08	03	00	01 (एल0वी0-01)	01	06
	<b>योग</b>	<b>513</b>	<b>176</b>	<b>124</b>	<b>04</b>	<b>163</b>	<b>46</b>	<b>05</b>	<b>14</b>	<b>20</b>	<b>95</b>

- दिव्यांगजन की एल0वी0, एच0एच0, ओ0ए0, ओ0एल0, एल0सी0, डी0डब्ल्यू0 तथा ए0ए0वी0 चिन्हांकित उपश्रेणियां उपर्युक्त समस्त विषयों के लिए उभयनिष्ठ हैं।

सचिव