UTTAR PRADESH PUBLIC SERVICE COMMISSION

Advertisement No. A-3/E-1/2017
Date 05.05.2017

Assistant Conservator of Forest and Range Forest Officer (General Recruitment and Special Recruitment/Backlog) Examination-2017

Date of Starting of On-Line Application : 05th May, 2017

Last Date for Deposition of Examination Fee in the Bank : 01st June, 2017

Last Date for Submission of Applications : 05th June, 2017

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

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

NECESSARY INFORMATIONS TO APPLICANTS FOR FILLING THEIR APPLICATIONS THROUGH ON-LINE

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

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

(i) User instructions
(ii) View Advertisement
(iii) Apply

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

ON-LINE APPLICATION WILL BE COMPLETED IN THREE STAGES :

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

Second Stage:- After the completion of the procedure of first stage, 'Fee to be deposited [in INR]' shall be displayed with caption "Click here to proceed for payment". After clicking the above caption of 'Click here to proceed for payment", home page of State Bank MOPS (Multi Option Payment System) shall be displayed comprising of 03 modes of payment viz. (i) NET BANKING (ii) CARD PAYMENTS and (iii) OTHER PAYMENT MODES. After depositing the required fee by any one of the above prescribed modes, "Payment Acknowledgement Receipt (PAR)" shall be displayed alongwith detail of fee deposition, the print of which must be taken by clicking on "Print Payment Receipt".

Third stage :- On completion of the procedure of second stage click on "Proceed for final submission of application form (Part-2)" as a result of which 'format' shall be displayed. The candidates are required to enter all the required informations in the format. The photo and signature, duly scanned shall be uploaded also. The candidate should scan his/her photograph and signature in the prescribed size (the size will be mentioned at the specified spot in the On-line application). This should also be kept in notice that the photo must be latest passport size. In case the photo and signature, scanned in the prescribed size, are not uploaded, then the On-line system will not accept it. The procedure related for scanning of the photo and signature is laid down in the **Appendix-1**. After filling in all entries in the format, the candidates may click **'PREVIEW'** to see for themselves that all entries and informations are correctly entered and after satisfying themselves should click **'Submit'** button to forward the same to the Commission. It is essential that the candidate should fill all informations On-line correctly according to the instructions given and click the **'Submit'** button by the last date prescribed for submission of the application form. If the candidate does not click the **'Submit'** button, the On-Line application process shall not be completed finally and the candidate shall be accountable for this. After clicking the **'Submit'** button, the candidate may take a print of the application to preserve it with them. In the event of any discrepancy, the candidate will be required to submit the said print in the office of the Commission, otherwise his/her request shall not be entertained. However, it is clarified to the candidates that at the stage of Preliminary Examination, the hardcopy of the documents including their online application should not be sent to the commission.

2. The Application once submitted, will not be allowed to be modified.

3. Application Fee : In the **On-LINE** application process, after completing the procedure of first stage, Category wise prescribed examination fee is to be deposited as per instructions provided in second stage. The prescribed fee of preliminary examination for different categories is as under:-

1-	Unreserved/Other Backward Class	- Exam fee Rs. 100/- + On-line processing fee Rs. 25/- Total = Rs. 125/-
2-	Scheduled Caste/Scheduled Tribe	- Exam fee Rs. 40/- + On-line processing fee Rs. 25/- Total = Rs. 65/-
3-	Handicapped	- Exam fee NIL + On-line processing fee Rs. 25/- Total = Rs. 25/-
4-	Dependants of the Freedom Fighters/ Ex-Servicemen/Women	- According to the original category.

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

5. If the candidates want some correction or change in their submitted applications, they can submit another fresh complete applications ON-LINE with desired corrections along with prescribed fee within the last notified dates of the advertisement. The application fee deposited with the prior application will neither be returned nor adjusted in any condition. In the aforesaid condition the application of that Registration No. on which admit card candidate will appear in the examination, will be treated as final.

6. The U.P. Public Service Commission shall hold a Preliminary Examination at various Centres of the Districts mentioned in **Appendix-2** of this advertisement for selecting suitable candidates for admission to the Assistant Conservator of Forest and Range Forest Officer (General Recruitment and Special/Backlog Recruitment) Main (Written) Examination-2017. The selection will be made on the basis of total marks obtained by the candidates in Main (Written) Examination and Interview. The Centre of Examination, decided by the Commission, will be intimated to the candidates by means of their e-Admission Certificate. The no. of Districts/ Centres may be increased or decreased according to final Number of applications received in the office of the Commission.

7. No. of Vacancies : (1) For the post of Assistant Conservator of Forest, number of vacancies are 17 whose details are mentioned as below:-

Sr. No.	Name of the Post	Pay Scale/Grade Pay/ Status of Post	Total No. of Vacancies	Un-reserved (UR)	Scheduled Caste (SC)	Scheduled Tribe (ST)	Other Backward Classes (OBC)
1.	Assistant Conservator of Forest	Rs. 15600/- to Rs. 39100/- Grade Pay - 5400/- Group "B", Gazetted	17	13	02	--	02

(2) (A) For the post of Range Forest Officer (General Recruitment), number of vacancies are 48 whose details are mentioned as below:-

Sr. No.	Name of the Post	Pay Scale/Grade Pay/ Status of Post	Total No. of Vacancies	Un-reserved (UR)	Scheduled Caste (SC)	Scheduled Tribe (ST)	Other Backward Classes (OBC)
1.	Range Forest Officer	Rs. 9300/- to Rs. 34800/- Grade Pay - 4800/- Group "B", Gazetted	48	24	11	03	10

(B) Under the Special Recruitment/Backlog for the post of Range Forest Officer, number of vacancies are 72 whose details are mentioned as below:-

Sr. No.	Name of the Post	Pay Scale/Grade Pay/Status of Post	Total No. of Vacancies	Scheduled Caste (SC)	Scheduled Tribe (ST)	Other Backward Classes (OBC)
1.	Range Forest Officer	Rs. 9300/- to Rs. 34800/- Grade Pay - 4800/- Group "B", Gazetted	72	30	02	40

NOTE:- For Special/Backlog Recruitment to the post of Range Forest Officer, only Reserved Category candidates of S.C., S.T. and O.B.C. of U.P. are eligible. Therefore, aforesaid Reserved Category candidates of U.P. shall apply only.

The No. of vacancies may increase or decrease on the request of the Government in special circumstances.

8. Reservation : The reservation for Scheduled Castes of U.P./Scheduled Tribes of U.P./Other Backward Class candidates of U.P. shall be admissible in accordance with the provisions of prevailing Govt. Rules. Accordingly, reservation for category under horizontal as Dependents of Freedom Fighters of U.P., P.H. of U.P. and Women candidates of U.P. shall be admissible on settlement of vacancies. Reservation for P.H. of U.P. will be admissible for the notified/identified Posts, only on settlement of vacancies.

Note : (1) The Candidates claiming the benefit of reservation/age relaxation must obtain, in support of their category a certificate issued by competent authority on the proforma available on **Appendix-3** of the Website of this detailed advertisement and shall submit the same to the Commission when asked for. (2) All Reserved category candidates of U.P. must mention their Category/Sub Category in the Application. (3) Candidates claiming reservation/age relaxation in more than one category will be entitled to only one concession whichever is more beneficial to them. (4) The Scheduled Caste, Scheduled Tribes, Other Backward Class, Dependents of Freedom Fighter, PH and women candidates who are not the permanent residents of U.P. shall not be given the benefit of reservation. Such candidates shall be treated as the candidates of the General Category. (5) In case of women candidates the Caste certificate/Domicile certificate issued from father side only be treated valid. (6) It is mandatory for the candidates to enclose self-attested copies of all the certificates along with the application forms of Main (Written) Examination in support of the claims made by them in their application forms of Preliminary Examination regarding eligibility and category/sub Category for the benefit of reservation failing which their claim as a reserved category candidate shall not be entertained.

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

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

11. EDUCATIONAL QUALIFICATION : ESSENTIAL QUALIFICATION- For the Post of Assistant Conservator of Forest:- A Bachelor's degree with at least one of the subject namely Botany, Zoology, Chemistry, Physics, Mathematics, Geology, Forestry, Statistics or a Bachelor's degree in Agriculture or Bachelor's degree in Engineering from a University established by Law in India or a Foreign University approved by the Central Government from time to time, or a qualification recognised by the Government as equivalent thereto.

PREFERENTIAL QUALIFICATION : A candidate who has (1) served in the Territorial Army for a minimum period of two years, or (2) obtained a "B" certificate of N.C.C. shall other things being equal, be given preference in the matter of direct recruitment.

FOR THE POST OF RANGE FOREST OFFICER:- ESSENTIAL QUALIFICATION- A Bachelor's Degree with two or more of the subjects, namely Mathematics, Physics, Chemistry, Botany, Zoology, Forestry, Geology, Agriculture, Statistics, Horticulture and Environment or Bechelor's Degree in Agriculture or Bachelor's degree in Engineering or Bachelor's degree in Veterinary Science from a University established by Law in India or possess a qualification recognized by the Government as equivalent thereto.

PREFERENTIAL QUALIFICATION- A candidate who has: (I) Served in the Territorial Army for a minimum period of two years, or (II) Obtained a 'B' Certificate of National Cadet Corps, or (III) Represented the state in any game, shall, other things being equal, be given preference in the matter of direct recruitment.

MINIMUM PHYSICAL STANDARD : (A) For the Post of Assistant Conservator of Forest:- (1) No candidate for direct recruitment shall be appointed to the service unless he/she possesses the minimum standard for height and chest girth as specified below:-

Sex	Height	Chest girth (Fully expanded)	Expansion
1	2	3	4
Male	163 cms.	84 cms.	5 cms.
Female	150 cms.	79 cms.	5 cms.

Provided that the minimum height standard in case of candidates belonging to Scheduled Tribes and to races such as Gorkhas, Nepalies, Assamese, Meghalayan Tribal, Laddakhese, Sikkimiese, Bhutanese, Garhwalies, Kumaunies, Nagas and Arunachal Pradesh candidates, shall be as follows:-

Sex	Height
1	2
Male	152.5 cms.
Female	145.0 cms.

(2) The male candidates will be required to qualify in walking test of 25 kms. to be completed in Four hours and female candidates of 14 kms. to be completed in Four hours. The arrangement for conducting this test will be made by the Chief Conservator of Forests, Uttar Pradesh so as to synchronise with the sittings of the Medical Board.

(B) For the post of Range Forest Officer:-

(1) No candidate for direct recruitment shall be appointed to the service unless he/she possesses the minimum standard for height and chest girth as specified below:-

Sex	Height	Chest girth (Fully expanded)	Expansion
1	2	3	4
Male	163 cms.	84 cms.	5 cms.
Female	150 cms.	79 cms.	5 cms.

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Provided that the minimum standard of height in case of candidates belonging to Scheduled Tribes and to races such as Gorkhas, Nepalis, Gardhwalis, Kumaonis shall be as follows:-

Sex	Height
1	2
Male	152.5 cms.
Female	145 cms.

(2) The male candidates will be required to qualify a walking test of 25 kms. to be completed in Four hours and female candidates of 14 kms. to be completed in 4 hours. The arrangement for conducting this test will be made by the Principal Chief Conservator of Forests, Uttar Pradesh so as to synchronise with the sittings of the Medical Board.

PHYSICAL FITNESS : For Assistant Conservator of Forest (1) No candidate shall be appointed to a post in the service unless he/she be in good mental and bodily health and free from any physical defect likely to interfere with the efficient performance of his/her duties. Before a candidate is finally approved for appointment by direct recruitment he/she shall be required to pass an examination by a Medical Board. **(2)** A female candidate who as a result of test is found to be pregnant of Twelve weeks duration or more should be declared temporarily unfit. She should be re-examined for fitness after Six weeks from the date of confinement.

For Range Forest Officer:- (1) No candidates shall be appointed to a post in the service unless he/she be in good mental and bodily health and free from any physical defect likely to interfere with the efficient performance of his/her duties. Before a candidate is finally approved for appointment he/she shall be required to pass an examination by a Medical Board.

(2) A Female candidate who as a result of test is found to be pregnant of twelve weeks duration or more should be declared temporarily unfit. She should be re-examined for fitness after six weeks from the date of confinement.

Note : candidates before applying for the above mentioned posts should ensure himself/herself that he/she possesses the above physical standard.

12. AGE LIMIT : (i) Candidates must have attained the age of 21 years and must not have crossed the age of 40 years on July 1, 2017 i.e. they must have not been born earlier than 2nd July, 1977 and not later than July 1, 1996. For PH candidates, the maximum age limit is 55 years i.e. they must have not been born before 2nd July, 1962. **(ii) Relaxation in Upper Age Limit: (a)** Upper age limit shall be greater by five years for candidates belonging to Scheduled Castes of U.P., Scheduled Tribes of U.P., Other Back Ward classes of U.P., skilled players of U.P. of classified games and State Govt. employees of U.P. including the Teachers/Staff of the Basic Shiksha Parishad of U.P. as per G.O. No. 1648/79-5-2015, dated 19 June, 2015 and Teachers/Staff of the Government Aided Madhyamik Vidyalayas of U.P. as per G.O. NO. 1508/15-8-2015-3057/2015, dated 16 September, 2015 i.e. they must have not been born before 2nd July, 1972 (Only domiciled persons of U.P. are entitled for such age relaxation). (b) Upper age limit shall be greater by fifteen years for physically handicapped persons of U.P. (c) Upper age limit shall also be greater by five years for Group-'B' posts for the Emergency Commissioned Officers/Short Service Commissioned Officers/Ex-Army Personnel of U.P. who have rendered five years service in Army but there shall be no reservation for Group-'B' posts. No relaxation is admissible in upper age limit for D.F.F. candidates.

13. SOME INFORMATIONS ABOUT EXAMINATION AND INTERVIEW : (i) Only such candidates will be admitted to the Main (written) examination who are declared successful in the Preliminary Examination for which the successful Candidates will have to fill up another application form according to instructions of the commission and for this application, the Examination fee for Unreserved (General), Other Backward Class and for Candidates of Other States is Rs. 200/- and Rs. 25/- as On-line Processing fee = Rs. 225/- and for Scheduled Caste and Schedule Tribe Candidates of U.P. the fee is Rs. 80/- and Rs. 25/- as On-line processing fee = 105/- only. The Candidates of Physically Handicapped category of U.P. are exempted from fee but they have to pay Rs. 25/- only as On-line Processing fee, but the candidates of D.F.F. women candidates and Ex-Army Personnels, of U.P. shall have to deposit their fee according to their original category. **(ii)** Candidates should carefully note that they will have to appear in the main examination against the same Roll No. allotted for the Preliminary Examination. **(iii)** The dates and venue for the Main examination shall be informed by the Commission later on through e-Admit cards. **(iv)** Only such candidates will be called for interview who are declared successful on the basis of the main (written) examination. **(v)** Candidates will have to fill-up the prescribed application forms before the Interview (viva-voce test). **(vi)** Preferences for different posts will be asked at the time of Interview which will be treated final and no change therein will be worthy of being admitted. In this regard no application for error correction/modification shall be acceptable. **(vii)** All original certificates shall be verified at the time of Interview. Candidates will also be required to furnish four passport size Photographs, two unattested and two attested by their Head of Department or Head of the Institution where they have received education or by a Gazetted Officer at the time of Interview. **(viii)** Candidates serving under the Central or State Government will have to produce 'No Objection Certificate' from their employer at the time of interview issued by the competent authority. **(ix)** It is essential for the candidates to appear in the interview who qualify on the basis of Main Examination under the provisions laid down in Service Rules for service of recruitment.

NOTE: At the stage of main examination the candidates must send hard copy of their application form and enclose self-attested copies of all certificates in support of their claims rendered in the online application. In this connection, a separate press communique shall be published in due course by the commission. If they do not send the hard copy of the application form along with self attested copies of all certificates in support of their all claims, their candidature shall be cancelled.

14. IMPORTANT INSTRUCTIONS FOR CANDIDATES: (1) As per decision of the UPPSC a candidate will be liable to be debarred from this examination and all other future examinations and selections upto a maximum period of five years for furnishing any wrong information in his/her application form which cannot be substantiated by relevant documents or for any other malpractice. **(2)** No change in category, sub-category, Date of Birth and optional subjects for main (written) Examination etc. is permissible after the receipt of application form in the office of the Commission. In this regard no application for error correction/modification shall be acceptable. **(3)** The date of birth of the candidates shall be admissible as entered in High School Certificate. The candidate will have to attach his/her High School or Equivalent Examination Certificate with the application form of main Examination. No Other Certificate shall be acceptable for Date of Birth and if it is not attached with the application, it shall be rejected. **(4)** The candidates will have to enclose self attested copies of Marksheets, Certificates & Degrees alongwith the application form of Main Examination in support of their claims of Educational Qualifications. If they do not enclose self attested copies of certificates/documents in support of their claims, the application shall be rejected. **(5)** The benefit of reservation to the categories of Handicapped persons of society shall be given only on the posts which are identified by the Government for their Sub category. For this benefit, the Handicapped persons must produce a certificate of being handicapped in that Sub category on the prescribed proforma issued by prescribed Medical Officer/Specialist and counter signed by the Chief Medical Officer according to Rule 2 of U.P. Public Service (Reservation for physically Handicapped, Dependent of Freedom Fighters and Ex-Serviceman (Amendment) Act, 1997 read with G.O. dated 03 Feb., 2008). The ex-army personnels must be discharged from Army up to the last date prescribed for receipt of applications. **(6)** Date, time and venue etc. of examination along with Roll No. will be communicated to the candidates through e-Admit Cards. Candidates will have to appear at the centre/venue allotted to them by the Commission. No change in centre/venue is permissible and no application shall be entertained in this regard. **(7)** The candidature of such candidates who are subsequently found ineligible according to the terms laid down in advertisement will be cancelled and their any claim for the Main Examination will not be entertained. The decision of the Commission regarding eligibility of the candidates shall be final. **(8)** The Application/candidature will be rejected/cancelled if the application is not submitted on prescribed form, date of birth is not mentioned or wrong date of birth is mentioned, overage, under age, not mentioning optional subjects in Application of main (written) examination, not fulfilling the minimum educational qualifications, applications received after last date and no signature under declaration in the format. **(9)** The Commission may admit the candidates provisionally after summarily checking of the applications but if it is found at any stage that applicant was not eligible or that his/her application should have been rejected or was not entertainable initially, his/her candidature will be rejected and if the candidate is selected, the recommendation of the Commission for the appointment shall be withdrawn. **(10)** The Commission reserves the right of cancelling the candidature of any candidate found indulging in any malpractice i.e. copying in examination hall or indiscipline, misbehavior or canvassing for his/her candidature. On violation of these instructions, the candidates may be debarred from this examination as well as future examinations and selections. In this regard, decision of the Commission shall be final. **(11)** In all communication to the Commission, the candidate must mention the name of examination, advertisement no., registration no., date of birth, father's/ husband's name and also the Roll Number, if communicated. **(12)** Candidates selected for appointment will have to undergo Medical Examination as required under the Rules. **(13)** On the basis of the Preliminary Examination, approximately eighteen times candidates to the number of vacancies, shall be declared qualified for the Main examination and approximately three times candidates on the basis of the Main examination shall be called for the interview. It is essential to be present in the interview specified in the service rules. **(14)** Scaling system will remain applicable in the optional subjects of the main examination. **(15)** The candidates who are appearing in the examination of essential qualification prescribed for the posts need not apply, because they are not eligible. **(16)** While filling the answer sheets, the candidates must use Black Ball Point Pen Only. Use of any other pen or pencil is strictly prohibited. **(17)** The candidates must fillup his/her all informations correctly in the answer sheets with Black Ball Point Pen. The informations filled in the Answer sheets must not be erased by whitener, blade or rubber etc.

GENERAL INSTRUCTIONS

1. In no circumstances, applications of any stage shall be accepted after the last prescribed date and time. Applications found without requisite informations and without photograph and signature, even when received in time, will be summarily rejected.

2. In the On-line system, the candidates must ensure that all the requisite informations have been duly filled and must click the submit Button by the Last prescribed Date & Time. They must take the print and keep it safely. In any discrepancy, they will have to produce the said print otherwise no request shall be entertained.

3. Those candidates, willing to take the benefit of the reservation/age relaxation must obtain a certificate, issued by the competent authority, in support of the reserved category, in the prescribed format printed in this detailed advertisement **(Appendix-3)** and submit the same to the Commission, whenever required to do so. Those claiming more than one reservation/age relaxation will be given only one such concession, which will be more beneficial. The candidates who are not originally domiciled of U.P. belonging to SC, ST, O.B.C., dependants of freedom fighters, P.H., women and State Government employees, Teachers etc. are not entitled to benefit of reservation/age relaxation. Such candidates will be treated as general candidates. In case of the women candidates, the domicile/caste certificate issued from father side will be treated valid.

4. The Commission do not advise to candidates about their eligibility. Therefore, they should carefully read the advertisement and when satisfied about their eligibility as per conditions of the advertisement, then only apply. The candidates must possess all the requisite qualifications till the last date for submitting the applications.

5. In the category of dependants of the freedom fighters only sons, daughters, grandsons (son's son/daughter's son) and grand daughters (son's daughter/daughter's daughter, married/unmarried) are covered. Only such relationships with the freedom fighters are not adequate but the candidate should remain actually dependent of the freedom fighter. Drawing the attention of the candidates towards Govt. orders dated 22.01.1982, 08.03.1983 and Govt. Order No. 3014, Personnel-2, 1982 dated 18.10.1982 read with Govt. Order No. 6/1972 Personnel-2, 1982 dated 15.01.1983, it is advised that now the candidates must obtain the reservation certificate from the District Magistrate in terms of Govt. Order No. 453/79-V-1-15-1 (Ka) 14-2015 dated 07.04.2015 in the prescribed format and submit the same.

6. In the event of involvement of a candidate in the concealment of any important information, pendency of any case/criminal case, conviction, more than a husband or wife being alive, submission of facts in a distorted manner, malpractice, canvassing for selection etc., the Commission reserves the right to reject the candidature and debar from appearing in the examination in question and all future other examinations and selections.

7. In case the candidates feel any problem in the **'On-line Application'** they may get their problem resolved by contacting over phone or on Website by clicking **'Contact us'**.

8. The name of Districts for Preliminary Examination are available in the advertisement in **Appendix-2** and proformae for reservation on **Appendix-3**. In the same way the plan of Examination on **Appendix-4**, the syllabus for Preliminary Examination on **Appendix-5** and Instructions and syllabus for main Examination on **Appendix-6** respectively.

Detailed Application Form:

At the top of the page there is a **Declaration**. The candidates are advised to go through the contents of the **Declaration** carefully. Candidate has the option either to 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 disagree, the application will be dropped and the procedure will be terminated. Accepting to agree only will submit the candidates Online Application.

Notification Details

This section shows information relevant to Notification.

Personal Details

This section shows information about candidate's personal details i.e. Registration Number, Candidate's Name, Father/Husband's Name, Gender, Date of Birth, UP domicile, Category, Marital status, email-ID and contact number.

Other Details of candidate

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

Education & Experience Details

It shows your educational and experience details.

Candidate address, photo & signature details

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

Declaration segment

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

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

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

Otherwise using “Back” button option you can modify your details.

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

For Other information:

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

CANDIDATE SEGMENT

NOTIFICATIONS/ADVTS.
All Notifications / Advertisements
ONLINE FORM SUBMISSION
1. Candidate Registration (FIRST STAGE)
2. Fee Deposition / Reconciliation (SECOND STAGE)
3. Submit Application Form (THIRD STAGE)
APPLICATION FORM STATUS
Update your transaction ID by Double Verification mode
View Application Status
List of Applications Having Photo related Objections
Print Duplicate Registration Slip
Print Detailed Application Form
EXAMINATION SEGMENT
Print Address Slip for sending Documents to Commission [Only for Direct Recruitment]
DOWNLOAD SEGMENT
Download Admit Card
Download Interview Letter
Download Syllabus
Know your Registration No.
Click here to view Key Answer Sheet

Regarding application

continued..

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

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

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

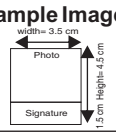
Appendix-1

The Procedure relating to upload Photo & Signature.

Guide Lines for Scanning Photograph with Signature

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

Sample Image & Signature :-



Appendix-2

The name of the districts in which the Preliminary Examination will be held are Allahabad and Lucknow.

Appendix-3

उ0प्र0 की अनुसूचित जाति तथा अनुसूचित जनजाति के लिये जाति प्रमाण–पत्र

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

श्री / श्रीमती / कुमारी ..... तथा अथवा उनका परिवार उत्तर प्रदेश के ..... ग्राम ..... तहसील ..... नगर ..... जिला ..... में सामान्यतया रहता है।

स्थान ..... हस्ताक्षर .....
दिनांक ..... पूरा नाम .....
मुहर ..... पद नाम .....

जिलाधिकारी / अतिरिक्त जिलाधिकारी / सिटी मजिस्ट्रेट / परगना मजिस्ट्रेट / तहसीलदार / अन्य वेतन भोगी मजिस्ट्रेट यदि कोई हो / जिला समाज कल्याण अधिकारी

उत्तर प्रदेश के अन्य पिछड़े वर्ग के लिए जाति प्रमाण–पत्र

(प्रारुप–I)

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

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

श्री / श्रीमती / कुमारी ..... तथा / अथवा उनका परिवार उत्तर प्रदेश के ग्राम ..... तहसील ..... नगर .....जिला ..... में सामान्यतया रहता है।

स्थान ..... हस्ताक्षर .....
दिनांक ..... पूरा नाम .....
मुहर ..... पद नाम .....

जिलाधिकारी / अतिरिक्त जिलाधिकारी / सिटी मजिस्ट्रेट / परगना मजिस्ट्रेट / तहसीलदार।

उ.प्र. के विकलांगों के लिए प्रमाण–पत्र

CERTIFICATE FOR PHYSICALLY HANDICAP OF U.P.

NAME & ADDRESS OF THE INSTITUTE/HOSPITAL
Certificate No. ..... Date .....

DISABILITY CERTIFICATE

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

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

A. Locomotor or cerebral palsy:
(i) BL-Both legs affected but not arms.
(ii) BA-Both arms affected
(a) Imparied reach (b) Weakness or grip
(iii) BLA-Both legs and both arms affected
(iv) OL-One leg affected (right or left)
(a) Imparied reach (b) Weakness of grip (c) Ataxic
(v) OA-One arm affected
(a) Imparied reach (b) Weakness of grip (c) Ataxic
(vi) BH-Stiff back and hips (Cannot sit or stood)
(vii) MW- Muscular weakness and limited physical endurance
B. Blindness or Low Vision: (i) B-Blind
(ii) PB-Partialy Blind
C. Hearing impairment:
(i) D-Deaf (ii) PD-Partially Deaf
(Delete the category whichever is not applicable)

2. This condition is progressive/non-progressive/likely to improve/not likely to improve. Re-assessn of this case is not recommended/is recommended after a period of ..... year ..... months.
3. Percentage of disability in his/her case is ..... percent.
4. Sh./Smt./Kum. ..... meets the following physical requirements discharge of his/her duties:

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

(Dr. .....) Member Medical Board
(Dr. .....) Member Medical Board
(Dr. .....) Chairperson Medical Board
Countersigned by the Medical Superintendent/ CMO/HQ Hospital (with seal)

*Strike out which is not applicable.

उत्तर प्रदेश लोक सेवा (शारीरिक रूप से विकलांग, स्वतंत्रता संग्राम सेनानियों के आश्रितों और भूतपूर्व सैनिकों के लिए आरक्षण) अधिनियम, 1993 (यथासंशोधित) के अनुसार स्वतंत्रता संग्राम सेनानी के आश्रित के प्रमाण–पत्र का प्रपत्र।

प्रमाण–पत्र

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

हस्ताक्षर .....
पूरा नाम .....
स्थान ..... मुहर .....
दिनांक ..... जिलाधिकारी
सील

कुशल खिलाड़ियों के लिये प्रमाण–पत्र जो उ.प्र. के मूल निवासी हैं
शासनादेश संख्या–22 / 21 / 1983–कार्मिक–2 दिनांक 28 नवम्बर, 1985

प्रमाण–पत्र के फार्म–1 से 4 प्रारूप–1

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

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

प्रमाणित किया जाता है कि श्री / श्रीमती / कुमारी ..... आत्मज / पत्नी / आत्मजा श्री ..... निवासी ..... पूरा पता ..... ने दिनांक ..... से दिनांक ..... तक ..... (स्थान का नाम) में आयोजित ..... (क्रीड़ा / खेल–कूद का नाम) की प्रतियोगिता / टूर्नामेन्ट में देश की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता / टूर्नामेन्ट में ..... स्थान प्राप्त किया गया।

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

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

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

प्रारूप – 2

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

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

प्रमाणित किया जाता है कि श्री / श्रीमती / कुमारी ..... आत्मज / पत्नी / आत्मजा श्री .... निवासी (पूरा पता) ..... ने दिनांक ..... से दिनांक ..... तक .... में (क्रीड़ा / खेल–कूद का नाम) की प्रतियोगिता (टूर्नामेन्ट स्थान का नाम) ..... आयोजित राष्ट्रीय ..... में (क्रीड़ा / खेल–कूद का नाम) की प्रतियोगिता / टूर्नामेन्ट में देश की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता / टूर्नामेन्ट 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 / टूर्नामेन्ट में ... . विश्वविद्यालय की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता / टूर्नामेन्ट 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)

continued..

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

प्रमाणित किया जाता है कि श्री/श्रीमती/कुमारी ..... आत्मज/पत्नी/आत्मजा श्री .... निवासी (पूरा पता) ..... में ..... स्कूल में कक्षा ..... के विद्यार्थी ने दिनांक ..... से दिनांक ..... तक ..... (स्थान का नाम) में आयोजित स्कूलों के नेशलन गेम्स की ..... (क्रीड़ा/खेल–कूद का नाम) प्रतियोगिता/टूर्नामेन्ट में ..... स्कूल की ओर से भाग लिया। उनके टीम के द्वारा उक्त प्रतियोगिता/टूर्नामेन्ट में ..... स्थान प्राप्त किया गया। यह प्रमाण–पत्र डाइरेक्ट्रेट ऑफ पब्लिक इन्सट्रक्शन्स/शिक्षा में उपलब्ध रिकार्ड के आधार पर दिया गया है।

स्थान ..... हस्ताक्षर .....

दिनांक ..... नाम .....

पद..... .....

संस्था का नाम .....

मुहर .....

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

APPENDIX-4
SECTION-1
PLAN OF EXAMINATION AND SYLLABUS

The competitive examination for the Assistant Conservator of Forest and Range Forest Officer (General Recruitment and Special/Backlog Recruitment) Examination, 2017 Comprises-

(1) Preliminary Examination

S.N.	Question Paper	Time Period	Marks
01	General Studies-Ist Paper	2 hours	200
02	General Studies-IInd Paper	2 hours	200

Paper-II of the General Studies will be a qualifying paper with minimum qualifying marks fixed at 33%.

(2) Main (Written) Examination

S.N.	Question Paper	Time Period	Marks
01	Paper-I General Hindi and Essay (Conventional Type)	2 hours	200
02	Paper-II General Studies-Ist Paper (Objective Type)	2 hours	200
03	Paper-III General Studies-IInd Paper (Objective Type)	2 hours	200
04	Paper-IV Optional Subject-I (First Question Paper) (Conventional Type)	3 hours	200
	Paper-V Optional Subject-I (Second Question Paper) (Conventional Type)	3 hours	200
05	Paper-VI Optional Subject-II (First Question Paper) (Conventional Type)	3 hours	200
	Paper-VII Optional Subject-II (Second Question Paper) (Conventional Type)	3 hours	200
	Total Marks of all the question papers		**1400**

Personality Test (Interview) - 150 Marks

Grand Total - 1400 + 150 = 1550 Marks

Any two subjects to be selected from the following list of the optional subjects-

1. Agriculture
2. Agriculture Engineering
3. Botany
4. Chemistry
5. Chemical Engineering
6. Civil Engineering
7. Forestry
8. Geology
9. Mathematics
10. Mechanical Engineering
11. Physics
12. Statistics
13. Zoology
14. Animal Husbandry and Veterinary Science
15. Horticulture
16. Environmental Science.

Provided that the candidates will not be allowed to offer the following combination of subjects-

(a) Agriculture, Agriculture Engineering and Horticulture

(b) Mathematics and Statistics

(c) Chemistry and Chemical Engineering

(d) of the Engineering Subjects viz. Agriculture Engineering, Chemical Engineering, Civil Engineering and mechanical Engineering not more than one subject.

Note- The standard and syllabus of the subjects mentioned above are given in this advertisement under schedule to the **appendix-6**.

Appendix-5
Syllabus for Preliminary Examination
Paper-I
General Studies-I

Duration: Two hours
Marks - 200

* Current events of national and international importance.
* History of India and Indian National Movement.
* Indian and World geography - Physical, Social, Economic geography of India and the World.
* Indian Polity and governance - Constitution, Political System, Panchayati Raj, Public Policy, Rights Issues etc.
* Economic and Social Development - Sustainable Development, Poverty Inclusion, Demographics, Social Sector Initiatives, etc.
* General Issues on Environmental ecology, Bio-diversity and Climate Change- that do not require subject specialization.
* General Science

Current events of national and international Importance:- On Current Events of National and International Importance, candidates will be expected to have knowledge about them.

History of India & Indian National Movement:- In History emphasis should be on broad understanding social, economic and political aspects of Indian History. In the Indian National Movement, the candidates are expected to have synoptic view of nature and character of the freedom movement, growth of nationalism and attainment of Independence.

Indian and World Geography - Physical, Social, Economic geography of India and the World: In World Geography only general understanding of the subject will be expected. Questions on the Geography of India will relate to Physical, Social & Economic Geography of India.

Indian Polity and Governance - Constitution, Political System, Panchayati Raj, Public Policy, Rights Issues, etc.:- In Indian Polity, Economic and Culture, questions will test knowledge of country's political system including Panchayati Raj and Community Development, broad features of Economic policy in India and Indian Culture.

Economic and Social Development - Sustainable Development, Poverty, Inclusion, Demographics, Social Sector Initiatives, etc.:- The candidates will be tested with respect to problems and relationship between Population, Environment and Urbanisation.

General Issues on Environmental ecology, Bio-diversity and Climate Change - that do not require subject specialization, General awareness of the subject is expected from candidates.

General Science:- Questions on General Science will cover general appreciation and understanding of Science including matters of every day observation and experience, as may be expected of a well educated person, who has not made a special study of any scientific discipline.

Note:- Candidates are expected to have general awareness about the above subjects with special reference to Uttar Pradesh.

Paper-II
General Studies-II

Duration : Two hours
Marks - 200

" Comprehension.
" Interpersonal skills including communication skills.
" Logical reasoning and analytical ability.
" Decision making and problem solving.
" General mental ability
" Elementary Mathematics upto Class X level- Arithmatic, Algebra, Geometry and Statistics.
" General English upto Class X level.
" General Hindi upto Class X level.

Elementary Mathematics (Upto Class X Level)

1. Arithmetic:- (i) Number systems: Natural Numbers, Integers, Rational and Irrational numbers, Real numbers, Divisors of an Ineger, prime Integers, L.C.M. and H.C.F. of integers and their Interrelationship.

(ii) Average (iii) Ratio and proportion (iv) Percentage (v) Profit and Loss (vi) Simple and Compound Interests (vii) Work and Time (viii) Speed, Time and Distance

2. Algebra :- (i) Factors of polynomials, L.C.M. and H.C.F. of polynomials and their Interrelationship, Remainder theorem, simultaneous linear equations, quadratic equations. (ii) Set Theory:- Set null set, subsets and proper subsets of a set, operations (Union, Intersections, difference, symmetric difference) between sets, venn diagram.

(3) Geometry:- (i) Constructions and theorems regarding triangle, rectangle, square, trapezium and circles, their perimeter and area. (ii) Volume and surface of sphere, right circular cylinder, right circular Cone and Cube.

Statistics:- Collection of data, Classification of data, frequency, frequency distribution, tabulation, cumulative frequency. Representation of data - Bar diagram, Pie chart, histogram, frequency polygon, cumulative frequency curves (ogives) , Measures of Central tendency: Arithmetic Mean, Median and Mode.

General English Upto Class X Level

1. Comprehension
2. Active Voice and Passive Voice
3. Parts of Speech
4. Transformation of Sentences
5. Direct and Indirect Speech
6. Punctuation and Spellings
7. Words meanings
8. Vocabulary & Usage
9. Idioms and Phrases
10. Fill in the Blanks

सामान्य हिन्दी (हाईस्कूल स्तर तक) के पाठ्यक्रम में सम्मिलित किये जाने वाले विषय

(1) हिन्दी वर्णमाला, विराम चिन्ह
(2) शब्द रचना, वाक्य रचना, अर्थ
(3) शब्द–रूप
(4) संधि, समास
(5) क्रियायें
(6) अनेकार्थी शब्द
(7) विलोम शब्द
(8) पर्यायवाची शब्द
(9) मुहावरे एवं लोकोक्तियां
(10) तत्सम एवं तद्भव, देशज, विदेशी (शब्द भंडार)
(11) वर्तनी
(12) अर्थबोध
(13) हिन्दी भाषा के प्रयोग में होने वाली अशुद्धियाँ
(14) उ0प्र0 की मुख्य बोलियाँ

APPENDIX -6
General Instructions and Syllabus for Main (Written) Examination.

1. All the question papers for the examination will be of conventional (essay) type but general studies will be objective type.
2. All question papers must be answered in Hindi or English. Question papers will be set in Hindi and English.
3. The duration of each of the papers referred to above will be three hours but general studies will be two hours.

SECTION-II
Personality Test

The candidate will be interviewed by a board of competent and unbased observers. Personality test will be 150 Marks.

Schedule

The standard of papers in General Hindi and General Studies will be such as may expected of a Science or Engineering Graduate of an Indian University.

The Scope of the Syllabus for optional subject papers for the examination is broadily of the Honour's Degree level i.e. available higher than the Bachelor's Degree and lower than the Master's Degree. In the case of Engineering subject, the level corresponds to the Bachelor's Degree. There shall be no practical exam. in any subject.

OPTIONAL SUBJECTS

Total number of questions in the question papers of optional subjects will be eight. All questions will carry equal marks. Each paper will be divided into two parts, viz. Part A and Part B, each part containing four questions. Out of eight questions, five questions are to be attempted. One question in each part will be compulsory. Candidates will be required to answer three more questions out of the remaining six questions, taking at least one question from each part. In this way, at least two questions will be attempted from each part i.e. one compulsory question plus one more.

सामान्य हिन्दी एवं निबन्ध

समय – 3 घण्टा
पूर्णांक – 200

प्रथम खण्ड **सामान्य हिन्दी** **निर्धारित अंक 100**

1. अपठित गद्यांश का संक्षेपण, उससे सम्बन्धित प्रश्न, रेखांकित अंशों की व्याख्या एवं उसका उपयुक्त शीर्षक।
2. शासकीय, अर्द्धशासकीय, वैयक्तिक तथा व्यवसायिक समस्याओं के निराकरण हेतु सम्बन्धित को सम्बोधित पत्र, कार्यालय आदेश, अधिसूचना और परिपत्र सम्बन्धी पत्रलेखन/आलेखन।
3. अनेकार्थी शब्द, विलोम शब्द, पर्यायवाची शब्द, तत्सम एवं तद्भव, क्षेत्रीय, विदेशी (शब्द भण्डार), वर्तनी, अर्थबोध, शब्द–रूप, संधि, समास, क्रियायें, हिन्दी वर्णमाला, विराम चिन्ह, शब्द रचना, वाक्य रचना, अर्थ, मुहावरे एवं लोकोक्तियाँ, उ.प्र. की मुख्य बोलियाँ तथा हिन्दी भाषा के प्रयोग में होने वाली अशुद्धियाँ।

द्वितीय खण्ड **हिन्दी निबन्ध** **निर्धारित अंक 100**

इसके अन्तर्गत दो उपखण्ड होंगे। प्रत्येक उपखण्ड से एक–एक निबन्ध (कुल मिलाकर दो निबन्ध) लिखने होंगे। प्रत्येक निबन्ध की विस्तार सीमा 700 शब्द होगी। निबन्ध हेतु निम्नवत् क्षेत्र होंगेः–

(अ) (i) साहित्य, संस्कृति (ii) राष्ट्रीय विकास योजनायें/क्रियान्वयन (iii) कृषि, उद्योग एवं व्यापार।

(ब) (i) विज्ञान, पर्यावरण (ii) प्राकृतिक आपदायें एवं उनके निवारण (iii) राष्ट्रीय, अन्तर्राष्ट्रीय, सामयिक सामाजिक समस्यायें/निदान।

General Studies, Paper-I

Time - 2.00 hrs.
Marks - 200

1. History of India - Ancient, Mediaeval, Modern
2. Indian National Movement and Indian Culture.
3. Population, Environment and Urbanization in Indian Context.
4. World Geography, Geography of India and its natural resources.
5. Current events of national and International Importance.
6. Indian Agriculture, Trade and Commerce.
7. Specific Knowledge of U.P. regarding education, Cultural, Agricultural, Trade, Commerce, the methods of living and Social Customs.

History of India and Indian culture will cover the broad history of the country from about the middle of the nineteenth century and would also include questions on Gandhi, Tagore and Nehru. The part on current events of national and international Importance will include questions also on sports and games.

General Studies, Paper-II

Time - 2.00 hrs.
Marks - 200

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1. Indian Polity
2. Indian Economy
3. General Science (Role of Science and technology in the development of India including science in every day life)
4. General Mental ability.
5. Statistical Analysis, Graphs and Diagrams.

The part relating to Indian polity will include questions on the political system in India and Indian constitution. The Indian economy will cover broad features of economic policy in India. The part relating to role and impact of science and technology in the development of India, questions will be asked to test the candidates awareness in this field. Emphasis will be on the applied aspects. The part relating to statistical analysis, graphs and diagrams will include exercise to test the candidates ability to draw common sense conclusions from information presented in statistical graphical or diagrammatical form and to point out deficiencies limitation or inconsistencies there in.

OPTIONAL SUBJECTS

Total number of questions in the question papers of optional subjects will be eight. All questions will carry equal marks. Each paper will be divided into two parts, viz. Part A and Part B, each part containing four questions. Out of eight questions, five questions are to be attempted. One question in each part will be compulsory. Candidates will be required to answer three more questions out of the remaining six questions, taking at least one question from each part. In this way, at least two questions will be attempted from each Part i.e. one compulsory question plus one more.

AGRICULTURE

PAPER-I

Ecology and its relevance to man, natural resources, their sustainable management and conservation, Physical and Social environment as factors of crop distribution and production Climatic elements as factors of crop growth, Impact of changing environment on cropping pattern as indicators of environments. Environmental pollution and associated hazards to crops, animals, and humans.

Cropping pattern in different agro-climatic zones of the country, Impact of high-yielding and short-duration varieties on shifts in cropping pattern. Concepts of multiple cropping, multi-storey, relay and inter-cropping, and their importance in relation to food production. Package of practices for production of important cereals, pulses, oil seeds, fibres, sugar, commercial and fodder crops grown during Kharif and Rabi seasons in different regions of the country.

Important features, scops and propagation of various types of forestry plantations such as extension, social forestry, agro-forestry and natural forests.

Weeds, their characteristics, dissemination and association with various crops; their multiplications; cultural, biological and chemical control of weeds. Soil-physical, chemical and biological properties, Processes and factors of soil formation. Modern classification of Indian soils, Mineral and organic constituents of soils and their role in maintaining soil productivity. Essential plant nutrients and other beneficial elements in soils and plants. Principles of soil fertility and its evaluation for judicious fertiliser use, integrated nutrient management. Losses of nitrogen in soil, nitrogen-use efficiency in submerged rice soils, nitrogen fixation in soils. Fixation of phosphorus and potassium in soils and the scope for their efficient use. Problem soils and their reclamation methods.

Soil conservation planning on watershed basis, Erosion and run-off management in hilly, foot hills and valley lands; processes and factors affecting them. Dry land agriculture and its problems. Technology of stabilising agriculture production in rain fed agriculture area.

Water-use efficiency in relation to crop production, criteria for scheduling irregations, ways and means of reducing run-off losses of irrigation water. Drip and sprinkler irrigation. Drainage of water-logged soils, quality of irrigation water, effect of industrial effluents on soils and water pollution.

Farm management, scope, important and characteristics, farm planning. Optimum resources use and budgeting. Economics of different types of farming systems.

Marketing and pricing of agricultural inputs and outputs, price fluctuations and their cost; role of co-operatives in agricultural economy; types and systems of farming and factors affecting them.

Agricultural extension, its importance and role, methods of evaluation of extension, programmes, socio-economic survey and status of big, small and marginal farmers and landless agricultural laborers; farm mechanization and its role in agricultural production and rural employment. Training programmes for extension workers; lab-to-land programmes.

PAPER-II

Cell Theory, cell structure, cell organelles and their function, cell division, nucleic acids-structure and function, gene structure and function. Laws of heredity, their significance in plant breeding, Chromosome structure, chromosomal aberrations, linkage and cross-over and their significance in recombination breeding. Polyploidy, euploids and aneuploids, Mutation-micro and macro-and their role in crop improvement, variation components of variation. Heritability, sterility and incompatibility, classification and their application in crop improvement, Cytoplasmic inheritance, sex-linked, sex-influenced and sex-limited characters.

History of plant breeding, Modes of reproduction, selfing and crossing techniques, Origin and evolution of crop plants, centre of origin, law of homologous series, crop genetic resources-conservation and utilization, Application of principles of plant breeding to the Improvement of major field crops. Pure-line selection, pedigree, mass and recurrent selections, combining ability, its significance in plant breeding. Hybrid vigour and its exploitation, backcross method of breeding, breeding for disease and pest resistance, role of interspecific and intergeneric hybridization. Role of biotechnology in plant breeding. Improved varieties, hybrids, composites of various crop plants.

Seed technology, its importance. Different kinds of seeds and their seed production and processing techniques. Role of public and private sectors in seed production, processing and marketing in India.

Physiology and its significance in agriculture, imbibition, surface tension, diffusion and osmosis. Absorption and translocation of water, transpiration and water economy. Enzymes and plant pigments; photosynthesis-modern concepts and factors affecting the process, aerobic and nonaerobic respiration; c, c and CAM mechanisms, Carbohydrate, protein and fat metabolism.

Growth and development; photoperiodism and vernalization. Auxins, hormones and other plant regulators and their mechanism of action and importance in agriculture. Physiology of seed development and germination; dormancy. Climatic requirements and cultivation of major fruits, plants, vegetables crops and flower plants; the package of practices and their scientific basis. Handling and marketing problems of fruit and vegetables. Principal methods of preservation of Important fruits and vegetable products, processing techniques and equipment. Role of fruits and vegetables in human nutrition. Raising of ornamental plants and design and layout of lawns and gardens.

Diseases and pests of field vegetables, orchard and plantation crops of India. Causes and classification of plant pests and diseases. Principles of control of plant pests and diseases. Biological control of pests and diseases. Integrated pest and disease management. Epidemiology and forecasting. Pesticides, their formulations and modes of action. Compatibility with rhizobial Inoculants. Microbial Toxins, Storage pests and diseases of cereals and pulses and their control.

Food production and consumption trends in India. National and International food policies. Production, procurement, distribution and processing constraints. Relation of food production to national dietary pattern, major deficiencies of calorie and protein.

AGRICULTURAL ENGINEERING

PAPER-I

SECTION A

1. Soil and Water Conservation: Scope of - Soil and water conservation. Mechanics and types of erosion, their causes. Mechanics and types of erosion, their causes. Rainfall, runoff and sedimentation relationships and their measurement. Soil erosion control measures-biological and engineering including stream bank protection-vegetative, barriers, contour bunds, contour trenches, contour stone walls, contour ditches, terraces, outlets and grassed waterways. Gully control structures-temporary and permanent-design of permanent soil conservation structures such as chute, drop and drop inlet spiliways. Design of farm, ponds and percolation ponds. Principles-of flood control-flood routing. Watershed Management-investigation, planning and implementation-selection of priority areas and water shed work plan, water harvesting and moisture conservation. Land development-levelling, estimation of earth volumes and costing. Wind Erosion process-design of shelter belts and wind brakes and their management. Forest (Conservation) Act.

2. Aerial Photography and Remote Sensing: Basic characteristics of photographic images, interpretation keys, equipment for interpretation, imagery interpretation for land use, geology soil and forestry.

Remote sensing-merits and demerits of conventional and remote sensing approaches. Types of satellite images, fundamentals of satellite image interpretation, techniques of visual and digital interpretations for soil, water and land use management. Use of GIS in planning and development of watersheds, forests including forest cover, water resources etc.

SECTION B

3. Irrigation and Drainage: Sources of water for irrigation. Planning and design of minor irrigation projects. Techniques of measuring soil moisture-laboratory and in situ, soil-water plant relationships. Water requirement of crops. Planning conjunctive use of surface and ground water. Measurement of irrigation water, measuring devices-orifices, weirs and flumes. Methods of irrigation-surface, sprinkler and drip, fertigation. Irrigation efficiencies and their estimation. Design and construction of canals, field channels, underground pipelines, head-gates, diversion boxes and structures for road crossing.

Occurence of ground water, hydraulics of wells, types of wells (tube wells and open wells) and their construction. Well development and testing. Pumps-types, selection and installation. Rehabilitation of sick and failed wells.

Drainage causes of water logging and salt problems. Methods of drainage-drainage of irrigated and unirrigated lands, design of surface, sub-surface and vertical drainage systems. Improvement and utilization of poor quality water. Reclamation of saline and alkali soils. Economics of irrigation and drainage systems. Use of waste water for irrigation-standards of waste water for sustained irrigation, feasibility and economics.

4. Agricultural Structures: Site selection, design and construction of farmstead-farm house, cattle shed, dairy barn, poultry shed, hog housing, machinery and implement shed, storage structures for food grains, feed and forage. Design and construction of fences and farm roads. Structures for plant environment-green houses, poly houses and shade houses. Commonbuilding materials used in construction-timber, brick, stone, tiles, concrete etc. and their properties. Water supply, drainage and sanitation systems.

PAPER-II

SECTION 'A'

1. Farm power and machinery: Agricultural mechanization and its scope. Sources of farm power-animate and electromechanical, Thermodynamics, construction and working of internal combustion engines. Fuel, ignition, lubrication, cooling and governing system of IC engines. Different types of tractors and power tillers. Power transmission, ground drive, power take off (p.t.o.) and control system. Operation and maintenance of farm machinery for primary and secondary tillage. Traction theory, Sowing transplanting and interculture implements and tools. Plant protection equipment-spraying and dusting. Harvesting, threshing and combining equipment. Machinery for earth moving and land development-methods and cost estimation. Ergonomics of man-machine system. Machinery for horticulture and agro-forestry, feeds and forages. Haulage of agricultural and forest produce.

2. Agro-energy: Energy requirements of agricultural operations and agroprocessing. Selection, Installation, safety and maintenance of electric motors for agricultural applications. Solar (thermal and photovoltic), wind and biogas energy and their utilization in agriculture, gasification of biomass for running IC engines and for electric power generation. Energy efficient cooking stoves and alternate cooking fuels. Distribution of electricity for agricultural and agro-industrial applications.

Section 'B'

3. Agricultural Process Engineering: Post harvest technology of crops and its scope. Engineering properties of agricultural produces and by products. Unit operations cleaning grading, size reduction, densification, concentration, drying/dehydration, evaporation, filtration, freezing and packaging of agricultural produces and by-products. Material handling equipment-belt and screw conveyors, bucket elevators, their capacity and power requirement.

Processing of milk and dairy products- homogenisation, cream separation, pasteurization, sterilization, spray and roller drying, butter making, Ice cream, cheese and shrikhand manufacture. Waste and by product utilization rice husk, rice bran, sugarcane bagasse, Plant residues and coir pith.

4. Instrumentation and computer applications in Agricultural Engineering: Electronic devices and other characteristics rectifiers, amplifiers, oscillators, multivibrators, Digital circuits-sequential and combinational system. Application of microprocessors in data acquisition and control of agricultural engineering processes-measurement systems for level, flow, strain, force, torque, power, pressure, vacuum and temperature. Computer-intruduction, input/outputdevies, central processing unit, memory devices, operating systems, processors, keyboards and printers. Algorithms, flowchart specification, programme translation and problem analysis in Agricultural Engineering. Multimedia and Audio-Visual aids.

BOTANY

PAPER-I

1. Microbiology and Plant Pathology: Viruses; bacteria and plasmids-structure and reproduction, General account of infection, Phytoimmunology. Applications of microbiology in agriculture, industry, medicine and pollution control in air, soil and water.

Important plant diseases caused by viruses, bacteria, mycoplasma, fungi nematodes. Mode of infection and dissemination. Molecular basis of infection and disease resistance/defence. Physiology of parasitism and control measures, Fungal toxins.

2. Cryptogams: Algae, Fungi, Bryophytes Pteridophytes-structure and reproduction from evolutionary view point. Distribution of Cryptogams in India and their economic potential.

3. Phanerogams Gymnosperms: Concept of Progymnosperms, Classfication and distribution of Gymnosperms. Salient features of Cycadales, Conferrals and Gnetales, their structures and reproduction, General account of Cycadofilicales, Bennettitales and Cordaitales.

Angiosperms: Systmatics, anatomy, embryology, palynology and phylogeny. Comparative account of various systems of Angiosperm Classification. Study of angiospermic families-Magnoliaceae, Ranunculaceae, Brassicaceae (Cruciferae), Rosacea Leguminosae, Euphorbiaceae, Malvaceae, Dipterocarpaceae Apiaceae (Umbelliferae), Asclepiadaceae Verbenaceae, Solanaceae, Rubiaceae Cucurbitaceae, Asteraceae (Composite) Poaceae (Gramineae), Arecaceae (Palmae), Liliaceae, Musaceae, Orchidaceae.

Stomata and their types. Anomalous secondary growth, Anatomy of C3 and C4 plants.

Development of male and female gametophytes, pollination, fertilization, Endosperm-its development and function. Patterns of embryo development, Polymbryony, apoxmis, Applications of palynology.

4. Plant Utility and Exploitation: Origin of cultivated plants, Vavilovs centres of origin. Plants as sources for food, fooder, fibres, spices, beverages, drugs, narcotics, insecticides, timber, gums, resins and dyes. Latex, cellulose Strach and their products. Perfumery, importance of Ethnobotany in Indian context. Energy plantation, Botanical Gardens and Herbaria.

5. Morphogenesis: Totipotency, polarity, symmetry and differentiation, Cell, tissue, organ and protoplast culture, Somatic hybrids and Cybrids.

PAPER-II

1. Cell Biology: Techniques of Cell Biology, Prokaryotic and eukaryotic cells- structural and Ultrastructural details. Structure and function of extracellular matrix of ECM (cell wall) and membranes-cell adhesion, membrane transport and vesicular transport-structure and function of cell organelles (chloroplasts, mitochondria, ER, ribosome's, endosomes, lysosomes, peroxisomes, hydrogenosome). Nucleus, nucleolus, nuclear pore complex, Chromatin and nucleosome. Cell signalling and cell receptors. Signal transduction (G-1 proteins, etc.), Mitosis and meiosis; molecular basis of cell cycle. Numerical and structural variations in chromosomes and their significance. Study of polytene, lampbrush and B-chromosomes-structure, behaviour and significance.

2. Genetics, Molecular Biology and Evolution : Development of genetics, and geneversus allele concepts (Pseudoalleles). Quantitative genetics and multiple factors. Linkage and crossing over- methods of gene mapping including molecular maps (idea of mapping function). Sex chromosomes and sexlinked inheritance, sex determination and molecular basis of sex differentiation. -Mutation (biochemical and molecular basis). Cytoplasmic inheritance and cytoplasmic genes (including genetics of male sterility). Prions and prion hypothesis. Structure and synthesis of nucleic acids and protines. Genetic code and regulation of gene expression. Multigene families.

Organic evolution-evidences, mechanism and theories. Role of RNA in origin and evolution.

3. Plant Breeding, Biotechnology an Bio-statistics: Methods of plant breeding introduction, selection and hybridisation' (pedigree, backcross, mass selection, bulk method). Male sterility and heterosis breeding. Use of apomixes in plant breeding. Micropropagation and genetic and genetic engineering methods of transfer of genes and transgenic crops; development and use of molecular markers in plant breeding, Standard deviation and coefficient of variation (CV). Tests of significance (Z-test, t-test and chi-square tests). Probability and distributions (normal, binomial and Poisson distributions), Correlation and regression.

4. Physiology and Biochemistry: Water relations, Mineral nutrition and ion transport, miniral deficiencies. Photosynthesis-photochemical reactions, photophosphory-lation and corbon

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pathways including C pathway (photorespiration), C, C and CAM pathways. Respiration (anaerobic and aerobic, including fermentation)-electron transport chain and oxidative phosporylation, Chemiosmotic theory and ATP synthesis. Nitrogen fixation and nitrogen metabolism. Enzymes, coenzymes, energy transfer and energy conservation. Importance of secondary metabolites. Pigments as photoreceptors (plastidial pigments and phytochrome). Photoperiodism and flowering, vernalization, senescence. Growth substances-their chemical nature, role and applications in agri-horticulture, growth indices, growth movements. Stress physiology (heat, water, salinity, metal). Fruit and seed physiology. Dormancy, storage and germination of seed. Fruit ripening-its molecular basis and manipulation.

5. Ecology and Plant Geography: Ecological factors, Concepts and dynamics of community. Plant succession. Concepts of biosphere, Ecosystems and their conservation. Pollution and its control (including phytoremediation).

Forest types of India-afforestation, deforestation and social, forestry. Endangered plants, endemism and Red Data Books. Biodiversity, Convention of Biological Diversity, Sovereign Rights and Intellectual Property Rights. Biogeochemical cells, Global warming.

CHEMISTRY
PAPER-I

1. Atomic Structure

Quantum theory, Heisenberg's uncertainity principle, Schordinger wave equation (time independent). Interpretation of wave function, particle in one-dimensional box, quantum numbers, hydrogen atom wave functions. Shapes of s, p and d orbitals.

2. Chemical Bonding

Ionic bond, characteristics of Ionic compounds, factors affecting stability of Ionic compounds, lattice energy, Born-haber cycle; covalent bond and its general characteristics, polarities of bonds in molecules and their dipole moments. Valence bond theory, concept of resonance and resonance energy. Molecular orbital theory (LCAO method); bonding in homonuclear molecules: H2+, H2 to Ne2 NO, CO, HF, CN, CN, BeH2 and CO2. Comparison of valence bond and molecular orbital theories, bond order, bond strength and bond length.

3. Solid State

Forms of solids, law of constancy of interfacil angles, crystal systems and crystal classes (crystallographic groups). Designation of crystal faces, lattice structures and unit cell. Laws of rational indices. Bragg's law. X-ray diffraction by crystals. Close packing, radious ratio rules, calculation of some limiting radius ration values. Structures of NaCl, ZnS, CsCl, CaF2, Cdl2 and rutile. Imperfection in crystals, stoichiometric and nonstoichiometric defects. Impurity defects, semi-conductors, Elementary study of liquid crystals.

4. The gaseous state

Education of state for real gases, Intermolecular Interactions, liquification of gases and critical phenomena, Maxwell's distribution of speeds, intermolecular collisions, collisions of the wall and effusion.

5. Thermodynamics and statistical thermodynamics

Thermodynamic systems, states and processes, work, heat and internal energy; first law of thermodynamics, work done on the systems and heat absorbed in different types of processes; calorimetry, energy and enthalpy changes in various processes and their temperature dependence.

Second law of thermodynamics; entropy as a state function, entropy changes in various process, entropy-reversibility and Irreversibility, Free energy functions; criteria for equilibrium, relation between equilibrium constant and thermodynamic quantities; Nernst heat theorem and third law of thermodynamics.

Micro and macro states; canonical esnemble and canonical partition function; electronic, rotational and vibrational partition functions and thermodynamic quantities; chemical equilibrium in ideal gas reactions.

6. Phase equilibria and solutions

Phase equilibria in pure substances; Clauslus-Clapeyron equation; phase diagram for a pure substance; phase equilibria in binary systems, partially miscible liquids- upper and lower critical solution temperatures; partial molar quantities, their significance and determination; excess thermodynamic functions and their determination.

7. Electrochemisty- Debye-Huckel theory of strong electrolytes and Debye-Huckel limiting Law for various equilibrium and transport properties.

Galvanic cells, concentration cells; electro-chemical series, measurement of e.m.f. of cells and its applications fuel cells and batteries.

Processes at electrodes; double layer at the interface; rate of charge transfer, current density; over-potential; electra-analytical techniques-voltameter, polarography, ampero-metry, cyclic-votametry, ion selective electrodes and their use.

8. Chemical Kinetics

Concentration dependence of rate of reaction; defferential and integral rate equations for zeroth, first, second and fractional order reactions. Rate equations involving reverse, parallel, consecutive and chain reactions; effect of temperature and pressure on rate constant. Study of fast reactions by stop-flow and relaxation methods, Collisions and transition state theories.

9. Photochemistry

Absorption of light; decay of excited state by different routes; photochemical reactions between hydrogen and halogens and their quantum yields.

10. Surface phenomena and catalysis

Adsorption from gases and, solutions on solid absorbents, adsorption isotherms-Langmuir and B.E.T. isotherms; determination of surface area, characteristics and mechanism of reaction on heterogeneous catalysts.

11. Bio-inorganic chemistry

Metal ions in biological systems and their role in ion-transport across the membranes (molecular-mechanism), Ionophores, photosynthesis-PSI, PSII; nitrogen fixation, oxygen-uptake proteins cytochromes and ferredoxins.

12. Coordination chemistry

(a) Electronic configurations; introduction of theories of bonding in transition metal complexes, Valence bond theory, crystal field theory and its modifications; applications of theories in the explanation of magnetism and electronic spactra of metal complexes.

(b) Isomerism in coordination compounds. IUPAC nomenclature of coordination compounds; stereochemistry of complexes with 4 and 6 coordination numbers; chelate effect and **polynuclear** complexes; trans effect and its theories; kinetics of substitution reaction in square-planer complexes; thermodynamic and kinetic stability of complexes.

(c) Synthesis and structures of metal carbonyls; carobxylate anions, cabonyl hydrides and metal nitrosyl compounds.

(d) Complexes with aromatic systems, synthesis, structure and bonding in metal olefin complexs, alkyne complexes and cyclopentadienyl complexes; coordi-native unsaturation, oxidative addition reactions, insertion reactions, fluxional molecules and their characterization. Compounds with metal-metal bonds and metal atom clusters.

13. General chemistry of 'f' block elements

Lanthanides and actinides; separation oxidation states, magnetic and spectral properties; lanthanide contraction.

14. Non-Aqueous Solvents

Reaction in liquid NH_3, HF, SO_2 and H_2SO_4 Failure of solvent system concept, Coordination model of non-aqueous solvents, Some highly acidic media, fluoro-sulphuric acid and super acids.

PAPER-II

1. Delocalised covalent bonding: Aromaticity, anti-aromaticity; annulenes, azulenes, tropolones, kekulene, fulvenes, sydones.

2. (a) Reaction mechanisms: General methods (both kinetic and non-kinetic) of study of mechanism or organic reactions illustrated by examples-use of isotope cross-over experiment, Intermediate trapping stereochemistry; energy diagrams of simple organic reactions- transition states and intermediates; energy of activation; thermodynamic control and kinetic control of reactions.

(b) Reactive Intermediates: Generation, geometry, stability and reactions of carbonium and carbonium ions, carbanions, free radicals, carbenes, benzynes and niternes.

(c) Substitution reactions: SN1, SN2, SNi, SN1', SN2', SNi' and SRN1 mechanisms; neighbouring group participation; electrophilic and nucleophilic reactions of aromatic compound including simple heterocyclic compounds-pyrrole, furan thiophene, indole.

(d) Elimination reactions: E1, E2 and E1cb mechanism; orientation in E2 reactions-Saytzeff and Hotfmann; pyrolytic syn elimination-acetate pyrolysis, Chugaev and Cope eliminations.

(e) Addition reactions: Electrophilic addition to C-C and C=C; nucleophilic addition to C=O, C-N, conjugated olefins and carbonyls.

(f) Rearrangements: Pinacol-pinacolune, Hoffmann, Beckmann, Baeyer-Villiger, Favorskii, Fries, Claisen, Cope, Stevens and Wagner Meerwein rearrangements.

3. Pericyclic reactions : Classification and examples; Woodward-Hoffmann, rules-electrocyclic reactions, cycloaddition reactions [2+2 and 4+2] and sigmatropic shifts [1, 3; 3,3 and 1,5] FMO approach.

4. Chemistry and mechanism of reactions:

Aldol condensation (including directed aldol condensation), Claisen condensation, Dleckmann, Perkin, Knoevenagel, Witting, Clemmensen, Wolff-Kishner, Cannizzaro and von Richter reactions; Stobbe, benzoin and acyloin condensations; Fischer indole synthesis, Skraup synthesis, Bischler-Napieralski, Sandmeyer, Reimer-Tiemann and Reformatsky reactions.

5. Polymeric Systems

(a) Physical chemistry of polymers: Polymer solution and their thermodynamic properties; number and weight average molecular weights of polymers, Determination of molecular weights by sedimentation, light scattering, osmotic pressure, viscosity and group analysis methods.

(b) Preparation and properties of polymers:

Organic polymers-polyethylene, polystyrene, polvinyl chloride, Teflon, nylon, terylene, synthetic and natural rubber, Inorganic polymers-phosphonitrilic halides, borazines, silicones and silicates.

(c) Biopolymers: Basic bonding in proteins, DNA and RNA.

6. Synthetic uses of reagents: OsO_4, HIO_4, Cro_3, $Pb(OAc)_4$, SeO2, NBS, B_2H_6, Na-Liquid NH_3, LiA1H4$NaBH_4$n-BuLi, MCPBA.

7. Photochemist: Photochemical reactions of simple organic compounds, excited and ground stales, singlet and triplet states, Norrish-Type I and Type II reactions.

8. Principles of spectroscopy and applications in structure elucidation

a) Rotational spectra: Diatomic molecules; isotopic substitution' and rotational constants.

b) Vibrational spectra: Diatomic molecules, linear triatomic molecules, specific frequencies of functional groups in polyatomic molecules.

c) Electronic spectra: Singlet and triplet states. N->p* and p->p* transitions; application to conjugated double bonds and conjugated carbonyls-Woodward Fieser rules.

d) Nuclear magnetic resonance: Isochronous and anisochronous protons; chemical shift and coupling constant; Application of H' NMR to simple organic molecules.

e) Mass spectra: Parent peak, base peak, daughter peak, matastable peak, fragmentation of simple organic molecule a cleavage, Mc-Latterly rearrangement.

f) Electron spin resonance: Inorganic complexes and free radicals.

CHEMICAL ENGINEERING
PAPER-I
Section A

a) Fluid and Particle Dynamics

Viscosity of fluids, Laminar and turbulent flows, Equation of continuity and Navier-Strokes equation-Bernoulli's theorem. Flow meters. Fluid drag and pressure drop due to friction Reynold's Number and friction factor-effect of pipe roughness. Economic pipe diameter. Pumps, water, air/stream jet ejectors, compressors, blowers and fans, agitation and mixing of liquids, Mixing of solids and pastes. Crushing and Grinding Principles and equipment. Rittinger's and Bond's laws. Filtration and filtration equipment. Fluid- particle mechanics-free and hindered setting. Fluidisation and minimum fluidisation velocity, concepts of compressible and incompressible flow. Transport of solids.

b) Mass Transfer

Molecular diffusion coefficient, First and second law and diffusion, mass transfer coefflecients, film and penetration theories of mass transfer, Distillation, simple distillation, relative volatility, fractional distillation, plate and packed columns of distillation. Calculation of packed columns for distillation. Calculation of theoretical number of plates. Liquid-liquid equilibria. Extraction-theory and practice;' design of gas-absorption columns, Drying, Humidification, dehumidi-fication, Crystallisation, Design of equipment.

c) Heat Transfer

Conduction, thermal conductivity, extended surface heat transfer.

Convection-free and forced. Heat transfer coefficients-Nusselt Number. LMTD and effectiveness. NTU methods for the design of Double Pipe and Shell & Tube Heat Exchangers, Analogy between heat and momentum transfer, Boiling and condensation heat transfer, single and multiple-effect evaporators. Radiation-. Stefan-Boltzman Law, emissivity and absorptivity. Calculation of heat load of a furnace, Solar heaters.

SECTION-B

d) Novel Separation Processes:

Equilibrium separation processesion exchange, osmosis, electro-dialysis, reverse osmosis, ultra-filtration and other membrane processes, Molecular distillation. Super critical fluid extraction.

e) Process Equipment design: Factors affecting vessel design criteria Cost considerations, Design of storage vessels-vertical, horizontal spherical, under-ground tanks for atmospheric and higher pressure. Design of closures flat and eliptical head. Design of supports. Materials of construction-characteristics and selection.

f) Process Dynamics and Control: Measuring instruments of process variable like level, pressure, flow, temperature pH and concentration with indication in visual/ pneumatic/analog/ digital signal forms. Control variable, manipulative variable and load variables. Linear control theory-Laplace, transforms. PID controllers. Block diagram representation, Transient and frequency response, stability of closed loop system. Advanced control strategies. Computer based process control.

PAPER II
SECTION-A

(a) Material and Energy Balances

Material and energy balance calculations in processes with recycle/bypass/purge, Combustion of solid/liquid/gaseous fuels, stoichiometric relationships and excess air requirements. Adiabatic flame temperature.

(b) Chemical Engineering Thermodynamics Laws of thermodynamics. PVT relationship for pure components and mixture, Energy functions and inter-relatioships-Maxwells relations, Fugacity, activity and chemical potential. Vapourliquid equilibria, for ideal/non-ideal, single and multi component systems. Criteria for chemical reaction equilibrium, equilibrium constant and equilibrium conversions, Thermodynamic cycles-refrigeration and power.

(c) Chemical Reaction Engineering

Batch reactors-kinetics of homogeneous reactions and interpretation of kinetic data. Ideal flow reactors-CSTR, plug flow reactors and their performance equations. Temperature effects and run-away reactions. Heterogeneous reactions-catalystic and non-catalystic and gas-solid and gas-liquid reactions. Interinsic kinetics and global rate concept. Importance of interphase and intraparticle mass transfer on performance.

Effective-nessfactor. Isothermal and non isothermal reactors and reactor stability.

SECTION-B

(d) Chemical Technology

Natural organic products-Wood and wood-based chemicals, pulp and paper, Agro-industries- sugar, Edible oils extraction (Including tree based seeds), Soaps and detergents, Essential oils- Biomass gasification (including biogas), Coal and coal chemical, Petroleum and Natural gas- Petroleum refining (Atmospheric distillation/cracking/reforming) Petrochemical industries- Polyethylene's (LDPE/HDPE/LLDPE), Polyvinyl Chloride, Polystyrene, Ammonia manufacture, Cement and lime industries, Paints and varnishes. Glass and ceramics Fermentation-alcohol and antibiotics.

(e) Environmental Engineering and Safety Ecology and Environment. Sources of pollutants in air and water, Green house effect, ozone layer depletion, acid rain. Micrometeorology and dispersion of pollutants in environment, Measurement techniques of pollutant levels and their control strategies. Solid wastes, their hazards and their disposal techniques, Design and performance analysis of pollution control equipment. Fire and explosion hazards rating HAZOP and HAZAN, Emergency planning, disaster management, Environmental legislations-water, air environment protection Acts. Forest (Conservation) Act.

(f) Process Engineering Economics

Fixed and working capital requirement for a process industry and estimation methods. Cost estimation and comparison of alternatives. Net present value by discounted cash flow. Pay back analysis. IRR, Depreciation, taxes and insurance, Break-even point analysis. Project scheduling-

continued..

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PERT and CPM, Profit and loss account, balance sheet and financial statement. Plant location and plant layout including piping.

CIVIL ENGINEERING

PAPER-1

Part-A

ENGINEERING MECHANICS, STRENGTH OF MATERIALS AND STRUCTURAL ANALYSIS,

ENGINEERING MECHANICS:

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

First and Second Moment of area, Mass moment of Inertia, Static Friction, Inclined Plane and bearings, Kinematics and Kinetics, Kinematics In Cartesian and Polar Coordinates, motion under uniform and nonuniform acceleration, motion under gravity, Kinetics of particle: Momentum and Energy principles, D'Alembert's Principle, Collision of elastic bodies, rotation of rigid bodies, simple harmonic motion, Flywheel.

STRENGTH OF MATERIALS:

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

STRUCTURAL ANALYSIS:

Castiglianios theroems I and II, Unit load method of consistent deformation applied to beams and pin jointed trusses. Slope-deflection, moment distribution, Kani's method of analysis and column Analogy method applied to indeterminate beams and rigid frames. Rolling loads and influences lines: Influences lines for Shear Force and Bending moment at a section of beam. Criteria for maximum shear force and bending Moment In beams traversed by a system of moving loads. Influences lines for simply supported plane pin jointed trusses.

Arches: Three hinged, two hinged and fixed arches, rib shortening and temperature effects, influence lines in arches.

Matrix methods of analysis: Force method and displacement method of analysis of indeterminate beams and rigid frames.

Plastic Analysis of beams and frames: Theory of plastic bending, plastic analysis, statical method, Mechanism method. Unsymmetrical bending: Moment of inertia, product of inertia, position of Neutral Axis and Principle axis, calculation of bending stresses.

PART-B

DESIGN OF STRUCTURES: STEEL, CONCRETE AND MASONRY STRUCTURES.

STRUCTURAL STEEL DESIGN:

Structural Steel: Factors of safety and load factors, Rivetted, bolted and welded joints and connections. Design of tension and compression member, beams of built up section, rivetted and welded plate girders, gantry girders, stancheons with battens and lacings, slab and gussetted column bases. Design of highway and railway bridges: Through and deck type plate girder, Warren girder, Pratt truss.

DESIGN OF CONCRETE AND MASONRY STRUCTURES:

Concept of mix design, Reinforces Concrete: Working Stress and Limit State method of design-recommendations of I.S codes, design of one way and two way slabs, stair-case slabs, simple and continuous beams of rectangular, T and L sections, Compression members under direct load with or without eccentricity, Isolated and combined footings. Cantilever and counterfort type retaining walls, Water tanks: Design requirements for rectangular and circular tanks resting on ground. Prestressed concrete; Methods and systems of prestressing, anchorages, analysis and design of sections for flexure beed on workingstress loss of prestress, Disign of brick masonry as per I.S. Codes Design of masonry retaining walls.

PART-C

FLUID MECHANICS, OPEN CHANNEL FLOW AND HYDRAULIC MACHINES

Fluid Mechanics: Fluid properties and their role in fluid motion, fluid statics including forces acting on plane and curve surfaces, Kinematics and Dynamics of Fluid flow: Velocity and accelerations, stream lines, equation of continuity, irrotational and rotational flow, velocity potential and stream functions, flownet, methods of drawing flownet, sources and sinks, flow separation, free and forced vortices.

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

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

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

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

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

Open Channel Flow: Uniform and nonuniform flows, momentum and energy correction factors, Specific energy and specific force, critical depth, resistance equations and variation of roughness coefficient, rapidly varied flow, flow in contractions, flow at sudden drop, hydraulic jump and its applications surges and waves, gradually varied flow, classification of surface profiles, control section, step method of Integration of varied flow equation, moving surges and hydraulic bore.

HYDRAULIC MACHINES AND HYDROPOWER:

Centrifugal pumps-Types, characteristics, Net Positive Suction-height (NPSH), specific speed, Pumps in parallel.

Reciprocating pumps, Air vessels, Hydraulic ram, efficiency parameters, Rotary and positive displacement pumps, diaphragm and jet pumps, Hydraulic turbines, types classification, Choice of turbines, performance parameters, controls, characteristics, specific speed. Principles of hydropower development. Type, layouts and Component works, surge tanks,'types and choice, Flow duration curves and dependable flow. Storage and pondage, Pumped storage plants, Special features of mini, micro-hydel plants.

Part-D

GEO TECHNICAL ENGINEERING

Types of soil, phase relationships, consistency limits particles size distribution, classifications of soil, structure and clay mineralogy. Capillary water and structural water, effectives trees and pore water pressure, Darcy's Law, factors affecting permeability, determination of permeability, permeability of stratified soil deposits.

Seepage pressure quick sand condition, compressibility and consoli-dation, Terzaghi's theory of one dimensional consolidation, consolidation test.

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

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

Immediate and consolidation settlement. Stability of slope, Total Stress and Effective Stress methods, Conventional methods of slices, stability number.

Subsurface exploration, methods of boring, sampling, penetration tests, pressure meter tests, Essential features of foundation, types of foundation, design criteria, choice of type of foundation, stress distribution in soils, Boussinessq's theory, Newmarks chart, pressure bulb, contact pressure, applicability of different bearing capacity theories, evaluation of bearing capacity from field tests, allowable bearing capacity, Settlement analysis, allowable settlement. Proportioning of footing, Isolated and combined footings, rafts, Buoyancy rafts, Pile foundation, types of piles, plies capacity, static and dynamic analysis, design, of pile groups, pile load test, settlement of piles, lateral capacity, Foundation for Bridges. Ground improvement techniques-preloading sand drains, stone column, grouting, soil stabilisation.

PAPER- II

Part-A

CONSTRUCTION TECHNOLOGY, EQUIPMENT, PLANNING AND MANAGEMENT

1. Construction Technology:

Engineering Materials: Physical properties of construction materials: Stones, Bricks and Tiles; Lime, Cement and Surkhi Mortars; Lime concrete and Cement concrete, Properties of freshly, mixed and hardened concrete, flooring Tiles, use of ferro-cement, fibre-reinforced and polymer concrete, high strength concrete and light weight concrete. Timber: Properties and uses; defects in timber; seasoning and preservation of timber, Plastics, rubber and damp-proofing materials, termite proofing, Materials for Low cost housing.

Construction: Building components and their functions; Brick masonry: Bonds, jointing, Stone masonry, Design of Brick masonry walls as per I.S. codes, factors of safety, serviceability and strength requirements; plastering, pointing, Types of Floors & Roofs, Ventilators, Repairs in buildings, Functional planning of building; Building orientation, circulation, grouping of areas, privacy concept and design of energy efficient building; provisions of National Building Code, Building estimates and specifications; Cost of works; valuation.

2. Construction Equipment:

Standard and special types of equipment, Preventive maintenance and repair, factors affecting the selection of equipment, economical life, time and motion study, capital and maintenance cost.

Concreting equipments: Weigh batcher, mixer, vibration, batching plant, Concrete pump.

Earth-work equipment: Power shovel hoe, bulldozer, dumper, trailers, and tractors, rollers, sheep foot roller.

3. Construction Planning and Management: Construction activity, schedules, Job layout, bar charts, organization of contracting firms, project control and supervision. Cost reduction measures.

New-work analysis: CPM and PERT analysis, Float times, cashing of activities, contraction of network for cost optimization, up dating, cost analysis and resource allocation.

Elements of Engineering Economics, methods of appraisal, present worth, annual cost, benefit-cost, incremental analysis. Economy of scale and size. Choosing between alternativesincluding levels of investments, project profitability.

Part-B

SURVEY AND TRANSPORTATION ENGINEERING

Survey: Common methods of distance and angle measurements, plane Table survey, levelling traverse survey, triangulation survey, corrections, and adjustments, contouring, topographical map. Surveying instruments for above purposes Techeometry, Circular and transition curves, Principles of photogrammetry.

Railway: Permanent way, sleepers, rail fastenings, ballast, points and crossings, design of turn outs, stations and yards, turn-tables, signals, and interlocking, level-crossing, Construction and maintenance of permanent ways: Superelevation, creep of rail, ruling gradient, track resistance, tractive effort, relaying of track.

Highway Engineering: Principles of highway planning, Highway alignments, Geometrical design:, Cross section, camber, superelevation, horizontal and vertical curves. Classification of roads: low cost roads, flexible pavements, rigid pavements, Design of pavements and their construction, evaluation of pavement failure and strengthening.

Drainage of roads: Surface and subsurface drainage.

Traffic Engineering: Forecasting techniques, origin and destination survey, highway capacity, Channelised and unchannelised Intersections, rotary design elements, markings, sign, signals, street lighting; Traffic surveys, Principle of highway financing.

Part-C

HYDROLOGY, WATER RESOURCES AND ENGINEERING

Hydrology: Hydrologilcal cycle, precipitation, evaporation, transpiration, depression storage, infiltration, overland flow, hydrograph, flood frequency analysis, flood estimation, flood routing through a reservoir, channel flow routing- Muskingam method.

Ground water flow: Specific yield, storage coefficient of permeability, confined and unconfined aquifers, aquifers, aquitards, radial flow into a well under confined and unconfined conditions, tube wells, pumping and recuperation tests, ground water potential.

WATER RESOURCES ENGINEERING:

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

IRRIGATION ENGINEERING: Water requirements of crops: consumptive use, quality of water for irrigation duty and delta, irrigation methods and their efficiencies.

Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most efficient section, lined canals, their design, regime theory, critical shear stress, bed load, local and suspended load transport, cost analysis of lined and unlied canals, drain-age behind lining.

Water logging: causes and control, drain-age system design, salinity.

Canal structures: Design of cross regulators, head regulators, canal falls, aqueducts, metering flumes and canal outlets.

Diversion head work: Principles and design of weirs of permeable and impermeable foundation, Khosle's theory, energy dissipation, stilling basin, sediment excluders.

Storage Works: Types of dams, design, principles of rigid gravity and earth dams, stability analysis, foundation treatment, joints and galleries, control of seepage. Spillways: Spillway types, crest gates, energy dissipation. River training: Objectives of river training, methods of river training.

Part-D

ENVIRONMENTAL ENGINEERING

Water Supply: Estimation of surface and subsurface water resources, predicting demand for, water, impurities of water and their significance, physical, chemical and bacteriological analysis, waterborne diseases, standards for potable water.

Intake of water: Pumping and gravity schemes. Water treatment: Principles of coagulation, flocculation and sedimentation; slow-, rapid-, pressure-, filters; chlorination, softening, removal of taste, odour and salinity.

Water storage and distribution: Storage and balancing reservoirs; types, location and capacity. Distribution system; layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations.

Sewerage systems: Domestic and Industrial wastes, storm sewage-separate and combined systems, flow through sewers, design of sewers, sewer appurtenances, manholes, in lets, junctions, siphon, Plumbing in Public buildings.

Sewage characterisation: BOD, COD, solids, dissolved oxygen, nitrogen and TOC, Standards of disposal in normal water course and on land.

Sewage treatment: Working principles, units, chambers, sedimentation tanks, trickling filters, oxidation ponds, activated sludge process, septic tank; disposal of sludge, recycling of waste water.

Solid waste: Collection and disposal in rural and urban contexts, management of long-term ill-effects.

Environmental pollution: Sustainable development. Radioactive wastes and disposal, Environmental impact assessment for thermal power plants, mines, river valley projects, Air pollution, Pollution control acts.

FORESTRY

PAPER-I

SECTION A

1. Silviculture-General:

General Silviculture Principles:

Ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests; methods of propagation, grafting techniques; site factors; nursery and planting techniques-nursery beds, poly-bags and maintenance, water budgeting, grading and hardening of seedlings; special approaches; establishment and tending.

2. Silviculture-Systems:

Clear felling, uniform shelter wood selection, coppice and conversion systems, Management of silviculture systems of temperate, subtropical, humid tropical, dry tropical and coastal tropical forests with special reference to plantation silviculture, choice of species, establishment and management of standards, enrichment methods, technical constraints, intensive mechanized methods, aerial seeding, thinning.

3. Silviculture Mangrove and Cold desert; Mangrove:

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Habitat and characteristics, mangrove, plantation-establishment and rehabilitation of degraded mangrove formations; silvicultural systems for mangrove; protection of habitats against natural disasters, Cold desert Characteristics, identification and management of species.

4. Silviculture of trees:

Traditional and recent advances in tropical silvicultural research and practices. Silviculture of some of the economically important species in India such as Acacia catechu, Acacia nilotica, Acacia auriculiformis, Albizzia lebbeck, Albizzia procera, Anthocephalus Cadamba, Anogeissus, latifokia. Azadirachta indica, Bamboo spp, Butea monosperma, Cassia siamea, Casuarina equisetifolia, Cedrus deodara, Chukrasia tabularis, Dalbergia sisoo, Dipterocarpus spp, Ernblica officindils, Eucalyptus spp, Gmelina Arborea, Hardwickia binata, Largerstroemia Lanceolata, Pinus roxburghi, Populus spp, Pterocarpus marsupium, Prosopis juliflora, Santalum album, Samecarpus anacrdium, Shorea robusta, Salmalla malabaricum, Tectona grandis, Terminalis tomemtosa, Tamarindus Indica.

SECTION- B

1. Agroforestry, Social Forestry, Joint Forest Management and Tribology: Agroforestry-Scope and necessity; role in the life of people and domestic animals and in integrated land use, planning especially related to (i) soil and water conservation; (ii) water recharge; (iii) nutrient availability to crops; (iv) nature and eco-system preservation including ecological balances through pest-predator relationships and (v) Providing opportunities for enhancing biodiversity, medicinal and other flora and fauna. Agro forestry systems under different agro ecological zones; selection of species and role of multipurpose trees and NTFPs, techniques, food, fodder and fuel security. Research and Extension needs.

Social/Urban Forestry: Objectives, scope and necessity; people's participation.

JFM- Principles, objectives, methodology, scope, benefits and role of NGOs.

Tribology: Tribal scene in India; tribes, concept of races, Principles of social grouping, stages of tribal economy, education, cultural tradition, customs, ethos and participation in forestry programmes.

2. Forest Soils, Soil Conservation Watershed Management:

Forests Soils: Classification, factors affecting soil formation; physical, chemical and biological properties.

Soil Conservation: definition, causes for erosion; typeswind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; sand dunes; reclamation of saline and alkaline soils, water logged and other waste lands. Role of forests in conserving soils. Maintenance and build up of soil organic matter, provision of loppings for green leaf manuring; forest leaf litter and composting; Role of micro-organisms in ameliorating soils; N and C cycles, VAM.

Watershed Management: Concepts of watershed; role of mini-forests and forest trees in overall resource management, forest hydrology, watershed development in respect of torrent control, river channel stabilization, avalanche and landslide controls, rehabilitation of degraded areas; hilly and mountain areas; watershed management and environmental functions of forests; water-harvesting and conservation; ground water recharge and watershed management; role of integrating forest trees, horticultural crops, field crops, grass and fodders.

3. Environmental Conservation and biodiversity:

Environment: Components and Importance, principles of conservation, impact of deforestation; forest fires and various human activities like mining, construction and developmental projects, population growth on environment.

Pollution: Types, Global warming, green house effects, ozone layer depletion, acid rain, impact and control measures, environmental monitoring; concept of sustainable development, Role of trees and forests in environmental conservation; control and prevention of air, water and noise pollution. Environmental policy and legislation in India, Environmental impact Assessment, Economics assessment of water shed development vis-a-vis ecological and environmental protection.

4. Tree Improvement and Seed Technology: General concept of tree improvement, methods and techniques, variation and its use, provenance, seed source, exotics; quantitative aspects of forest tree improvement, seed production and seed orchards, progeny tests, use of tree improvement in natural forest and stand improvement, genetic testing programming, selection and breeding for resistance to diseases, insects, and adverse environment: the genetic base, forest genetic resources and gene conservation in situ and ex-situ, Cost benefit ratio, economic evaluation.

PAPER- II

SECTION-A

1. Forest Management and Management Systems:

Objective and principles; techniques; stand structure and dynamics, sustained yield relation; rotation, normal forest, growing stock; regulation of yield; management of forest plantations, commercial forests, forest cover monitoring. Approaches viz., (i) site-specific planning, (ii) strategic planning, (iii) Approval, sanction and expenditure, (iv) Monitoring (v) Reporting and governance. Details of steps involved such as formation of Village Forest Committees, Joint Forest Participatory Management.

2. Forest Working Plan:

Forest planning, evaluation and monitoring tools and approaches for integrated planning; multipurpose development of forest resources and forest industries development; working plans and working schemes, their role in nature conservation, bio-diversity and other dimensions; preparation and control. Divisional Working Plans, Annual Plan of Operations.

3. Forest Mensuration and Remote Sensing: Methods of measuring- diameter, girth, height and volume of trees; form-factor; volume estimation of stand, current annual increment; mean annual increment, Sampling methods and sample plots. Yield calculation; yield and stand tables, forest cover monitoring through remote sensing; Geographic Information Systems for management and modelling.

4. Surveying and Forest Engineering:

Forest Surveying: different methods of surveying, maps and map reading, Basic principles of forest engineering. Building materials and construction. Roads and Bridges, General principles, objects, types, simple design and construction of timber bridges.

SECTION-B

1. Forest Ecology and Ethnobotany:

Forest Ecology: Biotic and abiotic components, forest eco-systems; forest community concepts; vegetation concepts, ecological succession and climax, primary productivity, nutrient cycling and water relations; physiology in stress environments (drought, water logging salinity and alkalinity). Forest types in India, identification of species, composition and associations; dendrology, taxonomic classification, principles and establishment of herbaria and arboreta. Conservation of forest ecosystems. Clonal parks.

Role of Ethnobotany in Indian Systems of Medicine; Ayurveda and Unani: Introduction, nomenclature, habitat, distribution and botanical features of medicinal and aromatic plants. Factors affecting action and toxicity of drug plants and their chemical constituents.

2. Forest Resources and Utilization: Environmentally sound forest harvesting practices; logging and extraction techniques and principles transportation systems, storage and sale; Non-Timber Forest Products (NTFPs) -definition and scope; gums, resins, oleoresins, fibres, oil seeds nuts, rubber, canes, bamboos, medicinal plants, charcoal, lac and shellac, katha and Bidi leaves, collection; processing and disposal, need and importance of wood, seasoning and preservation; general principles of seasoning, air and kiln seasoning, solar dehumidification, steam heated and electrical kilns, Composite wood; adhesives-manufacture, properties, uses, plywood manufacture-properties, uses, fibre boards-manufacture properties, uses; particle boards-manufacture; properties, uses, Present status of composite wood industry in India and future expansion plans. Pulp-paper and rayon; present position of supply of raw material to industry, wood substitution, utilization of plantation wood; problems and possibilities.

Anatomical structure of wood, defects and abnormalities of wood, timber identification general principles.

3. Forest Protection & wildlife Biology: Injuries to forest-abiotic and biotic, destructive agencies, insect-pests and disease, effects of air pollution on forests and forest die back, Susceptibility of forests to damage, nature of damage, cause, prevention, protective measures and benefits due to chemical and biological control. General forest protection against fire, equipment and methods, controlled use of fire, economic and environmental costs; timber salvage operations after natural disasters, Role of afforestation and forest regeneration in absorption of CO_2, Rotational and controlled grazing, different methods of control against grazing and browsing animals; effect of wild animals on forest regeneration, human impacts; encroachment, poaching, grazing, live fencing, theft, shifting cultivation and control.

4. Forest Economics and Legislation:

Forest economics: Fundamental principles, cost-benefit analysis; estimation of demand and supply; analysis of trends in the national and international market and changes in production and consumption patterns; assessment and projection of market structures; role of private sector and co-operatives; role of corporate financing. Socio-economic analysis of forest productivity and attitudes; valuation of forest goods and service.

Legislation-History of forest development; Indian Forest Policy of 1894, 1952 and 1990, National Forest Policy, 1988 of People's involvement, Joint Forest Management, Involvement of women; Forestry policies and Issues related to land use, timber and non-timber products, sustainable forest manage-ment; industrialisation policies; institutional and structural changes. Decentralization and Forestry Public Administration, Forest laws, necessity; general principles, Indian Forest Act 1927; Forest Conservation Act, 1980; Wildlife Protection Act 1972 and their amendments; Application of Indian Penal Code to Forestry, Scope and objectives of Forest Inventory.

GEOLOGY

PAPER-I

SECTION-A

(i) General Geology:

The Solar System, meteorities, origin and interior of the earth, Radioactivity and age of earth; Volcanoes-causes and products, volcanic belts, Earthquakes-causes, effects, earthquake belts, seismicity of India, intensity and magnitude, seismongraphs, Island arcs, deep sea trenches and mid-ocean ridges, Continental drift-evidences and mechanics; sea-floor spreading, plate tectonics. Isostasy, orogeny and epeirogeny. Continents and oceans.

(ii) Geomorphology and Remote Sensing:

Basic concepts of geomorphology, Weathering and mass wasting, Landforms, slopes and drainage. Geomorphic cycles and their interpretation, Morphology and its relation to structures and lithology. Applications of geomorphology in mineral prospecting, civil engineering, hydrology and environmental studies. Geomorphology of Indian sub-continent. Aerial photographs and their interpretation-merits and limitations. The Electromagnetic Spectrum. Orbiting satellites and sensor systems. Indian Remote Sensing Satellites. Satellites data products, Applications of remote sensing in geology. The Geographic Information System and its applications. Global Positioning System.

(iii) Structural geology:

Principles of geologic mapping and map reading, projection diagrams, stress and strain ellipsoid and stress-strain relationships of elastic, plastic and viscous materials, Strain markers in deformed rocks, Behaviour of minerals and rocks under deformation conditions, Folds and faults classification and mechanics. Structural analysis of folds, foliations, lineations, joints and faults, unconformities, Superposed deformation, Timerelationship between crystallization and deformation. Introduction to petrofabrics.

SECTION- B

(iv) Paleontology:

Species definition and nomenclature. Megafossils and Microfossils. Modes of preservation of fossils, Different kinds of micro fossils. Application of microfossils in correlation, petroleum exploration, paleo-climatic and pale oceanographic studies, Morphology, geological history and evolutionary trend in Cephalopoda, Trilobita, Brachiopoda, Echi-noidea and Anthozoa, Stratigraphic utility of Ammonoidea, Trilobita and Graptoloidea, Evolutionary trend in Hominidae, Equidae and Probo-scidae. Siwalik fauna, Gondwana flora and its importance.

(v) Stratigraphy and Geology of India:

Classification of Stratigraphic sequences: Lithostratigraphic, biostratigraphic, chronostratigraphic and magnetostratigraphic and the interrelation-ships, Distribution and classification of Precambrian rocks of India, Study of stratigraphic distribution and lithology of Phanerozoic rocks of India with reference to fauna, flora and economic importance, Major boundary problems-Cambrian/Precambrian, Permian/Triassic, Cretaceous/Tertiary and Pliocene/Pleistocene, Study of climatic conditions, paleogeography and igneous activity in the Indian subcontinent in the geological past, Tectonic framework of India. Evolution of the Himalayas.

(vi) Hydrogeology and Engineering Geology:

Hydrologic cycle and genetic classification of water. Movement of subsurface water, Springs, Porosity, permeability, hydraulic conductivity, transmissivity and storage coefficient, classification of aquifers. Water-bearing characteristics of rocks, Ground-water chemistry. Salt water intrusion, Types of wells. Drainage basin morphometry. Exploration for groundwater. Groundwater recharge, Problems and management of groundwater, Rainwater harvesting. Engineering properties of rocks. Geological Investigations for dams, tunnels and bridges, Rock as construction material. Alkali-aggregate reaction, Landslides causes, prevention and rehabilitation, Earthquake-resistant structures.

PAPER-II

SECTION-A

(i) Mineralogy:

Classification of crystals into systems and classes of symmetry. International system of crystallographic notation, Use of projection diagrams to represent crystal symmetry. Crystal defects. Elements of x-ray crystallography. Petrological microscope and accessories. Optical properties of common rock forming minerals, Pleochroism, extinction angle, double refraction birefringence, twinning and dispersion in minerals.

Physical and chemical characters of rock forming silicate mineral groups. Structural classification of silicates. Common minerals of igneous and metamorphic rocks. Minerals of the caronate, phosphate, sulphide and halide groups.

(ii) Igneous and Metamorphic Petrology Generation and crystallisation of magma. Crystallisation of albite-anorthite, diopside-anorthite and diopsidewollastonite-silica systems, Reaction principle, Magmatic differentiation and assimilation, Petrogenetic significance of the textures and structures of igneous rocks. Petrography and petrogenesis of granite, syenite, diorite, basic and ultrabasic groups, charnockite, anorthosite and alkaline rocks, Carbonatites. Deccan volcanic province, Types and agents of metamorphism, Metamorphic grades and zones, Phase rule. Facies of regional and contact metamorphism, ACF and AKF diagrams Textures and structures of metamorphic rocks, Metamorphism of arenaceous, argillaceous and basic rocks, Minerals assemblages, Retrograde metamorphism, Metasomatism and granitisation, migmatities, granulite terrains of India.

(iii) Sedimentology:

Sedimentary rocks : Processes of formation, diagenesis and lithification, Properties of sediments, Clastic and nonclastic rocks-their classification petrography and depositional environment, Sedimentary facies and provenance. Sedimenetary structures and their significance. Heavy minerals and their significance, Sedimentary basins of India.

SECTION-B

(iv) Economic Geology

Ore, ore minerals and gangue, tenor of ore, classification of ore deposits. Process of formation of minerals deposits, Controls of ore locallisation. Ore textures and structures, Metallogenic epochs and provinces, Geology of the important Indian deposits of aluminium, chromium, copper, gold, iron, lead, zinc, manganese, titanium, uranium and thorium and industrial minerals, Deposits of coal and petroleum in India, National Mineral Policy, Conservation and utilization of mineral resources, Marine mineral resources and Law of Sea.

(v) Mining Geology:

Methods of prospecting-Geological, geophysical, geo-chemical and geo-botanical, Techniques of sampling. Estimation of reserves of ore, Methods of exploration and mining metalic ores. Industrial minerals and marine mineral resources, Mineral beneficiation and ore dressing.

(vi) Geochemistry and Environmental Geology:

Cosmic abundance of elements, Composition of the planets and meteorites, Structure and composition of earth and distribution of elements, Trace elements, Elements of crystal chemistry types of chemical bonds, coordination number, Isomorphism and polymorphism, Elementary thermodynamics.

Natural hazards-floods, landslides, coastal erosion, earthquakes and volcanic activity and mitigation, Environmental impact of urbanization, open cast mining, industrial and radioactive waste disposal, use of fertilizers, dumping of mine waste and fly-ash, Pollution of ground and surface water, marine pollution, environment protection legislative measures in India.

MATHEMATICS

PAPER-I

Section-A

Linear Algebra:

Vector, space, linear dependence and independence, subspaces, bases, dimensions. Finite dimensional vector spaces. Matrices, Cayley-Hamilition theorem, eigen-values and eigenvectors,

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matrix of linear transformation, row and column reduction, Echelon form, equivalences, congruences and similarity, reduction to cannonical form, rank, orthogonal, symmetrical, skew symmetrical, unitary, hermitian, skew-hermitian forms- their eigenvalues. Orthogonal and unitary reduction of quadratic and hermitian forms, positive definite quardratic forms.

Calculus

Real numbers, limits, continuity, differentiability, mean-value theorems, Taylor's theorem with remainders, indeterminate forms, maxima and minima, asymptotes. Functions of several variables: continuity, differentiability, partial derivatives, maxima and minima, Lagrange's method of multipliers, Jacobian, Riemann's definition of definite integrals, indefinite integrals, infinite and improper integrals, beta and gamma functions. Double and triple integrals (evaluation techniques only). Areas, surface and volumes, centre of gravity.

Analytical Geometry

Cartesian and polar coordinates in two and three dimensions, second degree equations in-two and three dimensions; reduction to cannonical forms, straight lines, shortest distance between two skew lines, plane, sphere, cone, cylinder, paraboloid, ellipsoid, hyperboloid of one and two sheets and their properties.

Section-B

Ordinary Differential Equations:

Formulation of differential equations, order and degree, equations of first order and first degree, integrating factor, equations of first order but not of first degree, Clariaut's equation singular solution. Higher order linear equations with constant coefficients, complementary function and particular integral, general solution, Euler-Cauchy equation.

Second order linear equations with variable coefficients, determination of complete solution when one solution is known, method of variation of parameters.

Dynamics, Statics and Hydrostatics:

Degree of freedom and constraints, rectilinear motion, simple harmonic motion, motion in a plane, projectiles, constrained motion, work and energy, conservation of energy, motion under impulsive forces, Kepler's laws, orbits under central forces, motion of varying mass, motion under resistance.

Equilibrium of a system of particles, work and potential energy, friction, common catenary, principle of virtual work, stability of equilibrium, equilibrium of forces in three dimensions.

Pressure of heavy fluids, equilibrium of fluids under given system of forces, Bernoulli's equation, centre of pressure, thrust on curved surfaces, equilibrium of floating bodies, stability of equilibrium, meta-centre, pressure of gases.

Vector Analysis:

Scalar and vector fields, triple products, differentiation of vector function of a scalar variable, gradient, divergence and curl in Cartesian, cylindrical and spherical coordinates and their physical interpretations. Higher order derivatives, vector identities and vector equations. Application to Geometry; Curves in space curvature and torision. Serret-Frenet's formulae, Gauss and Stokes' theorems, Green's identities.

PAPER-II

SECTION-A

Algebra:

Groups, sub-groups, normal subgroups, homomorphism of groups, quotient groups, basic isomorphism theorems, Sylovi's group, permutation groups, Cayley theorem, rings and ideals, principal ideal domains, unique factorization domains and Euclidean domains. Field extensions, finite fields.

Real Analysis:

Real number system, ordered sets, bounds, ordered field, real number system as an ordered field with least upper bound property, Cauchy sequence, completeness, Continuity and uniform continuity of functions, properties of continuous functions on compact sets. Riemann integral, improper integrals, absolute and conditional convergence of series of real and complex terms, rearrangement of series, Uniform convergence, continuity, differentiability and integrability for sequences and series of functions. Differentiation of functions of several variables, change in the order of partial derivatives, implicit function theorem, maxima and minima, Multiple integrals.

Complex Analysis:

Analytic function Cauchy-Riemann equations, Cauchy's theorem, Cauchy's integral formula, power series, Taylor's series, Laurent's Series, Singularities, Cauchy's residue theorem, contour integration, Conformal mapping, bilinear transformations.

Linear Programming:

Linear programming problems, basic solution, basic feasible solution and optimal solution, graphical method and Simplex method of solutions, Duality.

Transportation and assignment problems, Travelling salesman problems.

SECTION-B

Partial differential equations:

Curves and surfaces in three dimensions, formulation of partial differentiation equations, solutions of equations of type dx/p=dy/q=dz/r; orthogonal trajectories, Pfaffian differential equations; partial differential equation of the first order, solution by Cauchy's method of characteristics; Charpit's method of solutions, linear partial differential equations of the second order with constant coefficients, equations of vibrating string, heat equation, Laplace equation.

Numerical analysis and Computer programming: Numerical methods solution of algebraic and transcendental equations of one variable by bisection, Regula-Falsi and Newton-Raphson methods, solution of system of linear equations by Gaussian elimination and Gauss-Jordan (direct) methods, Gauss-Seidel (iterative) method. Newton's (Forward and backward) and Lagrange's method of interpolation. Numerical integration; Simpson's one-third rule, tranpezodial rule, Gaussian quadrature formula. Numerical solution of ordinary differential equations: Euler and Runge Kuttamethods, Computer Programming: Storage of numbers in computers, bits, bytes and words, binary system, arithmetic and logical operations on numbers, Bitwise operations. AND, OR, SOR, NOT, and shift/ rotate operators, Octal and Hexadecimal Systems, Conversion to and form decimal Systems. Representation of unsigned integers, signed integers and reals, double precision reals and long integers.

Algorithms and flow charts for solving numerical analysis problems.

Developing simple programs in Basic for problems involving techniques covered in the numerical analysis.

Mechanics and Fluid Dynamics:

Generalised coordinates, constraints, holonomic and non-holonomic, systems, D'Alembert's principle and Lagrange's equations, Hamilton equations, moment of inertia, motion of rigid bodies in two dimensions. Equation of continuity, Euler's equation motion for inviscid flow, stream-lines, path of a particle, potential flow, two-dimensional and axisymetric motion, sources and sinks, vortex motion, flow past a cylinder and a sphere, method of images, Navier-Stokes equation for a viscous fluid.

MECHANICAL ENGINEERING

PAPER-I

1. Theory of Machines

Kinematic and dynamic analysis of planar mechanisms, Cams, Gears and gear trains, Flywheels, Governors, Balancing of rigid rotors, Balancing of single and multi-cylinder engines, Linear vibration analysis of mechanical systems (single degree and two degrees of freedom), Critical speeds and whirling of shafts, Automatic Controls, Belts and chain drives. Hydrodynamic bearings.

2. Mechanics of Solids

Stress and strain in two dimensions, Principal stresses and strains, Mohr's construction, linear elastic materials, isotropy and anisotropy, Stress-strain relations, unilaxial loading, thermal stresses, Beams: Banding moment and shear force diagrams, bending stresses and deflection of beams, Shear stress distribution. Torsion of shafts, helical springs, Combined stresses, Thick and thin walled pressure vessels. Struts and columns. Strain energy concepts ad theories of failure. Rotating discs. Shrink fits.

3. Engineering Materials

Basic concepts on structure of solids, crystalline materials, Defects in crystalline materials, Alloys anc, binary phase diagrams, structure and properties of common engineering materials. Heat treatment of steels, plastics, Ceramics and camposite. Materials, common applications of various materials.

4. Manufacturing Science

Merchant's force analysis, Taylor's tool life equation, machinability and machining economics, Rigid, small and flexible automation, NC, CNC. Recent machining methods-EDM, ECM and ultrasonic. Application of lasers and plasmas, analysis of forming processes. High energy rate forming Jigs, fixtures, tools and gauges, Inspection of length, position, profile and surface finish.

5. MANUFACTURING MANAGEMENT

Production Planning and Control, Forecasting-moving average exponential smoothing, Operations scheduling assembly line balancing. Product development, Breakeven analysis, Capacity planning, PERT and CPM, Control Operations: Inventory control-ABC analysis, EOQ model, Materials requirement planning, Job design, Job standards, work Measurement, Quality management- Quality control Operations Research: Linear programming-Graphical and Simplex methods, Transportation and assignment models, Single server queuing model. Value Engineering; Value analysis, for cost/value, Total quality management and forecasting techniques. Project management.

6. ELEMENTS OF COMPUTATION

Computer Organisation, Flow charting, Features of Common Computer Languages FORTRAN, d Base-III, Lotus 1-2-3, C and elementary programmings.

PAPER-II

1. THERMODYNAMICS:

Basic concept, Open and closed systems, Applications of Thermo-dynamic Laws., Gas equations, Clapeyron equation, Availability, Irreversibility and T ds relations.

2. I.C. Engines:

Fuels and Combustion: Spark Ignition and compression ignition engines, four stroke engine and two stroke engines, mechanical, thermal and volumetric efficiency, Heat balance.

Combustion process in S.I. and C.I. engines, pre-ignition detonation in S.I. engine Diesel knock in C.I. engine, Choice of engine fuels, Octane and Cetane ratings. Alternate fuels Carburration and Fuel injection, Engine emissions and control, Solid, liquid and gaseous fuels, stoichometric air requirements and excess air factor, fuel gas analysis, higher and lower . calorific values and their measurements.

3. HEAT TRANSFER, REFRIGERATION AND AIR CONDITIONING:

One and two dimensional heat conduction. Heat transfer from extended surfaces, heat transfer by forced and free convection, Heat exchangers, Fundamentals for diffusive and connective mass transfer, Radiation laws, heat exchange between black and non black surfaces, Network Analysis, Heat pump, refrigeration cycles and systems, Condensers, evaporators and expansion devices and controls, Properties and choice of refrigerant, Refrigeration Systems and components, psychometrics, comfort indices, cooling loading calculations, solar refrigeration.

4. TURBO-MACHINES AND POWER PLANTS:

Continuity, momentum and Energy Equations. Adiabatic and Isentropic flow, fanno lines, Raylegh lines, Theory and design of axial flow turbines and compressors, Flow through turbo-machine balde, cascades, centrifugal compressor. Dimensional analysis and modelling. Selection of site for steam, hydro nuclear and stand-by power plants, Selection base and peak load power plants, Modern High Pressure, High duty boilers, Draft and dust removal equipment, Fuel and cooling water systems, heat balance, station and plant heat rates, operation and maintenance of various power plants, preventive maintenance, economics of power generation.

PHYSICS

PAPER-I

SECTION-A

1. Classical Mechanics (a) Particle dynamics

Centre of mass and laboratory coordinates, conservation of linear and angular momentum, The rocket equation, Rutherford scattering, Galilean transformation, inertial and non-inertial frames, rotating frames, centrifugal and Coriolls forces; Foucault pendulum.

(b) System of particles

Constraints, degrees of freedom, generalised coordinates and momenta, Lagranje's equation and applications to linear harmonic oscillator, simple pendulum and central force problems Cyclic coordinates, Hamiltonian Lagrange's equation from Hamilton's principle.

(c) Rigid body dynamics

Eulerian angles, inertia tensor, principal moments of inertia. Euler's equation of motion of a rigid body, force-free motion of a rigid body, Gyroscope.

2. Special Relativity, Waves & Geometrica Optics

(a) Special Relativity

Michelson-Morley experiment and its implications, Lorentz transformations-length contraction, time dilation, addition of velocities, aberration and Doppler effect, mass energy relation, simple application to a decay process Minkowski diagram, four dimensional momentum vector. Covariance of equations of physics.

(b) Waves

Simple harmonic motion, damped oscillation forced oscillation and resonance, Beats. Stationary waves in a string. Pulses and wave packets. Phase and group velocities. Reflection and Refraction from Huygen's principle.

(c) Geometrical Optics

Laws of reflection and refraction from Format's principle. Matrix method in paraxial optic-thin-lens formula, nodal planes, system of two thin lenses, chromatic and spherical aberrations.

3. Physical Optics

(a) Interference

Interference of light-Young's experiment, Newton's rings, Interference by thin films, Michelson Interferometer. Multiple beam Interference and Fabry-Perot interferometer. Holography and simple applications.

(b) Diffraction

Fraunhofer diffraction-single slit, double slit, diffraction grating, resolving power. Fresnel diffraction:- half-period zones and zones plates. Fersnel integrals, Application of Cornu's spiral to the analysis of diffraction at a straight edge and by a long narrow slit. Deffraction by a circular aperture and the Airy pattern.

(c) Polarisation and Modern Optics

Production and detection of linearly and circularly polarised light. Double refraction, quarter wave plate, Optical activity, Principles of fibre optics attenuation; pulse dispersion in step index and parabolic index fibres; material dispersion, single mode fibres. Lasers-Einstein A and B coefficients; Ruby and He-Ne lasers. Characteristics of laser light-spatial and temporal coherence, Focussing of laser beams, Three-level scheme for laser operation.

SECTION-B

4. Electricity and Magnetism

(a) Electrostatics and Magneto-statics

Laplace and Poisson equations in electrostatics and their applications. Energy of a system of charges, multiple expansion of scalar potential. Method of images and its applications, Potential and field due to a dipole, force and torque on a dipole in an external field. Dielectrics, polarisation, Solutions, to boundary-value problems-conducting and dielectric spheres in a uniform electric field. Magnetic shell, uniformly magnetised sphere, Ferromagnetic materials, hysteresis, energy loss.

(b) Current Electricity

Kirchhoff's laws and their applications, Biot-Savart law, Ampere's law, Faraday's law, Lenz' law. Self and mutual inductances. Mean and rms values in AC circuits, LR, CR and LCR circuits-series and parallel resonance, Quality factor, Principle of transformer.

5. EectromagneticTheory & Black Body Radiation

(a) Electromagnetic Theory

Displacement current and Maxwell's equations Wave equations in vacuum, Poynting theorem, Vector and scalar potentials, Gauge invariance, Lorentz and Coulomb gauges, Electromagnetic field tensor, cavariance of Maxwell's equations, Wave equations in Isotropic dielectrics, reflection and refraction at the boundary of two dielectrics. Fresnel' relations, Normal and anamalous dispersion, Rayleigh scattering.

(b) Blackbody radiation

Blackbody radiation ad Planck radiation law-Stefan-Boltzmann law, Wien displacement law and Rayleigh-Jeans law, Planck mass, Planck length, Planck time, Planck temperature and Planck energy.

6. Thermal and Statistical Physics

(a) Thermodynamics

Laws of thermodynamics, reversible and irreversible processes, entropy, Isothermal, adiabatic, isobaric, isochoric processes and entropy change, Otto and Diesel engines, Gibb's phase rule and chemical potential. Van der Waals equation of state of real gas, critical constants, Maxwell-Boltzman distribution of molecular velocities, transport phenomena, equipartition and virial theorems, Dulong-Petit, Einstein, and Debye's theories of specific heat of solids. Maxwell relations

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and applications. Clausius-Clapeyron equation. Adiabatic demagnetisation, Joule-Kelvin effect and liquefication of gases.

(b) Statistical Physics

Saha ionization formula, Bose-Einstein condensation, Thermodynamic behaviour of an ideal Fermi gas, Chandrasekhar limit, elementary ideas about neutron stars and pulsars, Brownian motion as a random walk, diffusion process, Concept of negative temperatures.

PAPER-II

SECTION-A

1. Quantum Mechanics: Wave-particle duality, Schroedinger equation and expectation values. Uncertainty principle, Solutions of the one-dimensional Schroedinger equation free particle (Gaussian wave-packet), particle in a box, particle in a finite well, linear, harmonic oscillator, Reflection and transmission by a potential step and by a rectangular barrier, use of WKB formula for the life-time calculation in the alpha-decay problem.

2. Quantum Mechanics II & Atomic Physics

(a) Quantum Mechanics II

Particle in a three dimensional box, density of states, free electron theory of metals, The angular momentum problem, The hydrogen atom, The spin half problem and properties of Pauli spin matrices.

(b) Atomic Physics

Stern-Gerlack experiment, electron spin, fine structure of hydrogen atom, L-S coupling, J-J, coupling, Spectroscopic notation of atomic states, Zeeman effect, Frank-Condon principle and applications.

3. Molecular Physics

Elementary theory of rotational, vibrational and electronic spectra of diatomic molecules, Raman effect and molecular structure, Laser Raman spectroscopy importance of neutral hydrogen atom, molecular hydrogen and molecular hydrogen ion in astronomy Fluorescence and Phos-phorescence, Elementary theory, and applications of NMR. Elementary ideas about Lamb shift and its significance.

SECTION-B

4. Nuclear Physics

Basic nuclear properties-size, binding energy, angular momentum, parity, magnetic moment, Semi-empirical mass formula and applications, Mass parabolas, Ground state of deuteron magnetic moment and non-central forces, Meson theory of nuclear forces, Salient features of nuclear forces, Shell model of the nucleus-success and limitations, Violation of parity in beta decay, Gamma decay and internal conversion, Elementary ideas about Mossbauer spectroscopy, Q-value of nuclear reactions, Nuclear fission and fusion, energy production in stars, Nuclear reactors.

5. Particle Physics & Solid State Physics:

(a) Particle Physics

Classification of elementary particles and their interactions, Conservation laws, Quark structure of hadrons, Field quanta of electro-weak and strong Interactions, Elementary ideas about Unification of Forces, Physics of neutrinos.

b) Solid State Physics

Cubic crystal structure, Band theory of solids-conductors, insulators and semiconductors, Elements of superconductivity, Meissner effect, Joseph-son junctions and applications, Elementary ideas about high temperature superconductivity.

6. Electronics

Intrinsic and extrinsic semiconductors-p-n-p and n-p-n transistors. Amplifiers and oscillators, Op-amps, FET, JFET and MOSFET, Digital electronics-Boolean Identities, De-Morgan's laws, Logic gates and truth tables, Simple logic circuits, Thermistors, solar cells, Fundamentals of microprocessors and digital computers.

STATISTICS

PAPER-I

Probability

Sample space and events, probability measure and probability space, random variable as a measurable function, distribution function of a random variable, discrete and continuous-type random variable, probability mass function, probability density function, vector-valued random variable, marginal and conditional distributions, stochastic independence of events and of random variables, expectation and moments of a random variable, conditional expectation, convergence of a sequence of random variable in distribution, in probability, in p-th mean and almost everywhere, their criteria and inter-relations, Borel-Cantelli lemma, Chebyshev's and Khinchine's weak laws of large numbers, strong law of large numbers and Kolmogorov's theorems, Glivenko-Cantelli theorem, probability generating function, characteristic function, inversion theorem, Laplace transform, related uniqueness and continuity theorems, determination of distribution by its moments. Linderberg and Levy forms of central limit theorem, standard discrete and continuous probability distributions, their Inter-relations and limiting cases, simple properties of finite Markov chains.

Statistical Inference

Consistency, unbiasedness, efficiency, sufficiency, minimal-sufficiency, completeness, ancillary statistic, factorization theorem, exponential family of distribution and its properties, uniformly minimum variance unbiased (UMVU) estimation, Rao-Blackwell and Lehmann-Scheffe theorems, Cramer-Rao inequality for single and several-parameter family of distributions, minimum variance bound estimator and its properties, modifications and extensions of Cramer-Rao inequality, Chapman-Robbins inequality, Bhattacharya's bounds, estimation by methods of moments, maximum likelihood, least squares, minimum chisquare and modified minimum chi-square properties of maximum likelihood and other estimators, idea of asymptotic efficiency, idea of prior and posterior distributions, Bayes', estimators.

Non-randomised and randomised tests, critical function, MP tests, Neyman-Pearson lemma, UMP tests, monotone likelihood ratio, generalised Neyman Pearson lemma, similar and unbiased tests, UMPU tests for single and several-parameter families of distributions, likelihood rotates and its large sample properties, chi-square goodness of fit test and its asymptotic distribution.

Confidence bounds and its relation with tests, uniformly most accurate (UMA) and UMA unbiased confidence bounds, Kolmogororv's test for goodness of fit and its consistency, sign test and its optimality, Wilcoxon signed-ranks test and its consistency, Kolmogorov-Smirnov two-sample test, run test, Wilcoxon-Mann Whitney test and median test, their consistency and asymptotic normality.

Wald's SPRT and its properties, OC and ASN functions, Wald's fundamental identity, sequential estimation.

Linear Inference and Multivariate Analysis Linear statistical models, theory of least squares and analysis of variance, Gauss-Markoff theory, normal equations, least squares estimates and their precision, test of significance and interval estimates based on least squares theory in one-way, two-way and three-way classified data, regression analysis, linear regression, curvilinear regression and orthogonal polynomials, multiple regression, multiple and partial correlations, regression diagnostics and sensitivity analysis, calibration problems, estimation of variance and covariance components, MINQUE theory, multivariate normal distribution, Mahalanobis; D^2 and hotelling's T^2 statistics and their applications and properties, discriminant analysis, canonical correlations, one-way MANOVA, principal component analysis, elements of factor analysis.

Sampling Theory and Design of Experiments An outline of fixed-population and super-population approaches, distinctive features of finite population sampling, probability sampling designs, simple random sampling with and without replacement stratified random sampling, systematic sampling and its efficacy for structural populations, cluster sampling' two-stage and multi-stage sampling ratio and regression, methods of estimation involving one or more auxiliary Variables, two-phase sampling, probability proportional to size sampling with and without replacement, the Hansen-Hurwitz and the Horvitz-Thompson estimator. Non-negative variance estimation with reference to the Horvitz Thompson estimators, non-sampling errors, Warner's randomised response technique for sensitive characteristics.

Fixed effects model (two-way classification) random and mixed effects models (two-way classification with equal number of observation per cell), CRD, RBD, LSD and their analysis; incomplete block designs, concepts of chronogonality and balance, BIBD, missing plot technique, factorial designs: 2n, 3^2 and 3^3, confounding in factorial experiments, split-plot and simple lattice designs.

PAPER- II

I. Industrial Statistics

Process and product control, general theory of control charts, different types of control charts for variables and attributes, X, R, s, p, nn and c charts, cumulative sum chart, V-mask, single, double, multiple and sequential sampling plans for attribute, OC, ASN, AQQ and ATI curves concepts of producer's and consumer's risks, AQL, LTPD and AOQL, sampling plans for variables, use of Dodge-Roming and Military Standard tables, Concepts of reliability, maintainability and availability, reliability of series and parallel systems and other simple configurations, renewal density and renewal function, survival models (exponential, Weibull, lognormal, Rayleigh, and bath-tub), different types of redundancy and use of redundancy in reliability improvement, Problems in life-testing censored and truncated experiments for exponential models.

II. Optimization Techniques

Different types of models in Operational Research, their construction and general methods of solution, simulation and Monte-Carlo methods, the structure and formulation of linear programming (LP) problem, simple LP model and its graphical solution, the simplex procedure, the two-phase method and the M-technique with artificial variables, the duality theory of LP and its economic interpretation, sensitivity analysis, transportation and assignment problems, rectangular games, two-person zero- sum games, method of solution (graphical and algebraic).

Replacement of failing or deteriorating items, group and individual replacement policies, concept of scientific inventory management and analytical structure of inventory problems, simple models with deterministic and stochastic demand with and without lead time, storage models with particular reference to dam type. Homogeneous discrete-time Markov chains, transition probability matrix, classification of states and ergodic theorems, homogeneous continuous-time Markov chains, Poisson process, elements of queuing theory, M/M/1, M/M/K, G/M/1 and M/G/1 queues. Solution of statistical problems on computers using well-known statistical software packages like SPSS.

III. Quantitative Economics and Official Statistics

Determination of trend, seasonal and cyclical components, Box-Jenkins method, tests for stationery of series, ARIMA models and determination of orders of autoregressive and moving average components, forecasting.

Commonly used index numbers-Laspeyre's, Peashe's and Fisher's ideal Index numbers, chain-base index numbers, uses and limitations of index numbers, index number of wholesale prices, consumer price index number, index numbers of agricultural and industrial production, test for index numbers like proportionality test, time-reversal test, factor-reversal test, circular test and dimensional invariance test.

General linear model, ordinary least squares and generalised least squares methods of estimation, problem of multi-collinearity, consequences and solutions of multi-collinearty, autocorrelation and its consequences, heteroscedasticity of disturbances and its testing, test for independence of disturbances, Zellner's seemingly unrelated regression equation model and its estimation, concept of structure and model for simultaneous equations, problem of identification-rank and order conditions of identifiability, two-stage least squares method of estimation. Present official statistical sytem in India relating to population agriculture, industrial production, trade and prices, methods of collection of official statistics, their reliability and limitation and the principal publications containing such statistics, various official agencies responsible for data collection and their main functions.

IV. Demography and Psychometry

Demographic data from census, registration, NSS and other surveys, and their limitation and uses, definition, construction and uses of vital rates and ratios, measures of fertility, reproduction rates, morbidity rate, standardized death rate: complete and abridged life tables, construction of life tables from vital statistics and census returns, uses of life tables, logistic and other population growth curves, fitting a logistic curve, population projection, stable population theory, uses of stable population and quasi-stable population techniques in estimation of demographic parameters, morbidity and its measurement, standard classification by cause of death, health surveys and use of hospital statistics.

Method of standardisation of scales and tests, Z-scores, standard scores, T-scores, percentile scores, intelligence quotient and its measurement and uses, validity of test scores and its determination, use of factor analysis and path analysis in psychometry.

ZOOLOGY

PAPER-I

Sectlon-A

I. Non-chordata and chordata

(a) Classification and relationship of various phyla up-to sub-classes; Acoelomata and Coelomata; Protostomes and Deuterostomes, Bilateralia and Radiata; Status of Protista, Parazoa, Onychophora and Hemichordata; Symmetry.

(b) Protozoa: Locomotion, nutrition, reproduction; evolution of sex; general features and life history of Paramaecium, Monocystis, Plasmodium and Leisismania.

(c) Porifera: Skeleton, canal system and reproduction.

(d) Coelenterata: Polymorphism, defensive structures and their - mechanism; coral reefs and their formation; metagenesis; general features and life history of Obelia and Aurelia.

(e) Platyhelminthes: Parasitic adaptation; general features and life history of Fasciola and Taenia and their relation to man.

(f) Nemathelminthes: General features, life history and parasitic adaptation of Ascaris; nemathelminths in relation to man.

(g) Annelida: Coelom and metarnerism; modes of life in polychaetes; general features and life history of nereis (Neanthes), earthworm (Pheretima) and leach (Hirundaria).

(h) Arthropoda: Larval, forms and parasitism in Crustacea; vision and respiration in arthropods (prawn, cockroach and scorpion); modification of mouth parts in insects (cockroach, mosquito, housefly, honey bee and butterfly); metamorphosis in insects and its hormonal regulation; social organization in insects (termites and honey bees).

(i) Mollusca; Feeding, respiration, locomotion, shell diversity; general features and life history of Lamellidens, Pila and Sepia, torsion and detorsion in gastropods.

(j) Echinodermata; Feeding respiration, locomotion larval forms; general features and life history of Asterias.

(k) Protochordata; Origin of chordates; general features and life history of Branchiostoma and Herdamania.

(I) Pisces: Scales, respiration, locomotion, migration.

(m) Amphibia: Origin of tetrapods; parental care, paedomorphosis.

(n) Reptilia: Origin of reptiles; skull types; status of Sphenodon and crocodiles.

(o) Aves: Origin of birds; flight adaptation, migration.

(p) Mammalia: Origin of mammals; dentition; general features of egg-laying mammals, pouched mammals, aquatic mammals and primates; endocrine glands and other hormone producing structures (pituitary, thyroid, parathyroid, adrenal, pancreas, gonads) and their interrelationships.

(q) Comparative functional anatomy of various systems of vertebrates (integument and its derivatives, endoskeleton, locomotory organs digestive system, respiratory system, circulatory system including heart and aortic arches; urinogenital system, brain and sense organs (eye and ear).

Section-B

I. Ecology:

(a) Biosphere: Biogeochemical cycles, green-houses effect, ozone layer and its impact; ecological succession, biomes and ecotomes.

(b) Population, characteristics, population dynamics, population stabilization.

(c) Conservation of natural resources mineral mining, fisheries, acquaculture; forestry; grassland; wildlife (Project Tiger); sustainable production in agriculture-integrated pest management.

(d) Environmental biodegradation; pollution and its impact on biosphere and its prevention.

II. Ethology:

(a) Behaviour: Sensory filtering, responsiveness, sign stimuli, learning, instinct, habituation, conditioning, imprinting.

(b) Role of hormones in drive; role of pheromones in alarm spreading; crypsis, predator detection, predator tactics, social behaviour in insects and primates, courtship (Drosophila, 3-spine stickleback and birds).

(c) Orientation, navigation, homing; biological rhythms; biological clock, tidal, seasonal and circadian rhythms.

(d) Methods of studying animal behaviour.

III. Economic Zoology:

(a) Apiculture, sericulture, lac culture, carp culture, pearl culture, prawn culture.

(b) Major infectious and communicable diseases (small pox, plague, malaria, tuberculosis, cholera and AIDS) their vectors, pathogens, and prevention.

(c) Cattle and livestock diseases, their pathogens (helminths) and vectors (ticks, mites, Tabanus, Stomoxys)

(d) Pests of sugar cane (Pyrilla perpusiella), oil seed (Achaea Janata) and rice (Silophilus oryzae).

IV. Biostatistics:

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Designing of experiments; null hypothesis; correlation, regression, distribution and measure of central tendency, chi square, student t-test, F-test (one-way & two-way F-test)

V. Instrumental methods:

(a) Spectrophotometry, flame photometry, Geiger-Muller counter, scintillation counting.

(b) Electron microscopy (TEM, SEM).

PAPER-II

Section-A

I. Cell Biology:

(a) Structure and function of cell an its organelles (nucleus, plasma membrane, mitochondria, Golgibodies, endoplasmic reticulum ribosomes and lysosomes), cell division (mitosis and melosis), mitutic spindle and mitotic apparatus, chromosome movement.

(b) Watson-Crick model of DNA; replication of DNA, protein synthesis, transcription and transcription factors.

II. Genetics

(a) Gene structure and functions; genetic code.

(b) Sex chromosomes and Sex determination in Drosophilla, nematodes and man.

(c) Mendel's laws of inheritance, recombiriation, linkage, linkage-maps, multiple alleles, cistron concept; genetics of blood groups.

(d) Mutations and mutagenesis; radiation and chemical.

(e) Cloning technology, plasmids and cosmids as vectors, transgenics, transposons, DNA sequence cloning and whole animal cloning (Principles and methodology).

(f) Regulation and gene expression in pro-and eu-karyotes.

(g) Signal transduction; pedigree-analysis; congenital diseases in man.

(h) Human genome mapping; DNA fingerprinting.

III. Evolution

(a) Origin of life.

(b) Natural selection, role of mutation in evolution, mimicry, variation, isolation, speciation.

(c) Fossils and fossllization; evolution of horse, elephant and man.

(d) Hardy-Weinberg law, causes of change in gene frequency,

(e) Continental drift and distribution of animals.

IV. Systematics

(a) Zoological nomenclature; international code; cladistics.

Section-B

I. Biochemistry

(a) Structure and role of carbohydrates, fats, lipids, proteins, aminoacids, nucleic acids; saturated and unsaturated fatty acids, cholesterol.

(b) Glycolysis and Krebs cycle, oxidation and reduction, oxidative phosphorylation; energy conservation and release, ATP, cyclic AMP-its structure and role.

(c) Hormone classification (steroid and peptide hormones), biosynthesis and function.

(d) Enzymes: types and mechanisms of action; immunoglobulin and immunity; vitamins and co-enzymes.

(e) Bioenergetics.

II. Physiology (with special reference to mammals)

(a) Composition and constituents of blood; blood groups and Rh factor in man; coagulation, factors and mechanism of coagulation; acid-base balance, thermo regulation.

(b) Oxygen and carbon dioxide transport; haemoglobin: constituents and role in regulation.

(c) Nutritive requirements; role of salivary glands, liver, pancreas and intestinal glands in digestion and absorption.

(d) Excretory products; nephron and regulation of urine formation; osmoregulation.

(e) Types of muscles, mechanism of contraction of skeletal muscles.

(f) Neuron, nerve impulse-its conduction and synaptic transmission; neurotransmitters.

(g) Vision, hearing and olfaction in man.

(h) Mechanism of hormone action.

(i) Physiology of reproduction, role of hormones and phermones.

III. Developmental Biology

(a) Differentiation from gamete to neurula stage; dedifferentation; metaplasia, induction, morphogenesis and morphogon; fate maps of gastrulae in frog and chick; organogenesis of eye and heart, placentation in mammals.

(b) Role of cytoplasm in and genetic control of development; cell lineage; causation of metamorphosis in frog and insects; paedogenesis and neoteny; growth, degrowth and cell death; ageing; blastogenesis; regeneration; teratogenesis; neoplasia.

(c) Invasiveness of placenta; in vitro fertilization; embryo transfer, cloning.

(d) Baer's law; evo-devo concept.

Horticulture "Fruit and Plantation Crops"

Paper-I

Time - 3.00 hrs.
Marks - 200

Section 'A'

Definition of horticulture and its branches. Importance and scope of fruits and plantation crops in India. Area and production of different fruit crops. Geographical Classification of fruit crops. Nutritional garden. Planning and establishment of orchard. High density planting. Propagation methods and use of root stock. Micro-propagation, Nursery management, Methods of training and pruning. Use of Phytohormone in fruit production.

Section "B"

Package of practices for the cultivation of major fruits-- Mango, Banana, Citrus, Grape, Guava, Litchi and Papaya and Minor Fruits-- Pineapple, pomegranate, Bael, Aonla, Ber, Karaunda, Phalsa and Jackfruit and Plantation crops- Coffee, Tea and Coconut. Principles of fruit preservation. Preparation of Jam, Jelly and marmalade.

Horticulture "Vegetables and Ornamental crops"

Paper-II

Time - 3.00 hrs.
Marks - 200

Section "A"

Importance and scope of vegetable and ornamental crops. Vegetable garden, Classification of vegetable crops. Area, Production and Package of practices:- Tomato, Brinjal, Chilli, Okra, Watermelon, Muskmelon, Bottlegourd, Bittergourd, Cabbage, Cauliflower, Onion, Garlic, Beans, French bean, Pea, Potato, Elephant foot, Carrot, Radish, Amaranthus and Palak. Use of phytohormones in vegetable production. Organic production of vegetable. Protected cultivation of vegetables. OFF season vegetable production. Fertigation. Principles of vegetable preservation. Drying, Dehydration and canning of vegetables.

Section "B'

Importance of floriculture and ornamental gardens. Planning of ornamental garden. Style of garden and components of a garden. Use of trees, Shrubs and Climbers, Palm, Succulents and seasonal flowers in the garden. Package of practices for rose, Jasmine, Carnation, Marigold, Tuberose and gladiolus. Use of phytohormones in ornamental crops. Loose, cut and dry flowers. Medicinal and aromatic plant and spices.

Environmental Science

Paper First

Time - 3.00 hrs.
M.M. 200

Part-A

- Basics of Environmental Science, Definition meaning and Scope. Importance of the study of Environmental Science. Environmental Segments: Geosphere, lithosphere, Hydrosphere, atmosphere and biosphere- their spread, composition and Inter-relationships.
- **Environmental and ecological principles:** Ecological terminology and definitions, level of organization, habitat and niche, individual, species, population. Community, biome and ecosystem organization.
- **Ecological Succession:** Hydrarch and xerarch, concept of climax and seral communities
- **Concept of ecosystem:** biotic and abiotic components, structural and functional attributes of ecosystem, productivity, energy flow, food chain, food web and ecological pyramids, terrestrial and aquatic ecosystems. Biogeochemical cycles of C, N and P and hydrological cycle.

Part-B

- **Natural resources:-** water--its sources, surface and ground water, global distribution and uses of water, water crisis and conservational strategies.
- Soil and land, resources of India and its uses, conservational strategies and Integrated land use planning.
- **Minerals and matters-** their uses and mining operations.
- Forest resources of India, forest cover, community and social forestry, afforestation programmes, forest conservation Act and national forest conservation strategy.
- Biodiversity and its significance, Keystone species and hot spots, measurements of biodiversity, cause of biodiversity loss, conservation of biodiversity -in-situ and ex-situ conservation. Biological diversity Act.
- Wildlife sanctuaries and national parks in India, Wildlife conservation Act, concept of biosphere reserves.
- Renewable and non renewable sources of energy and its optimization.

Environmental Science

Paper- Second

Time - 3.00 hrs.
M.M. 200

Part-A

- Environmental disruptions, soil erosion, deforestation, drought, flood, fire and desertification-processes, causal factors and their mitigative measures.
- Environmental pollution: Air pollution-sources, effects on plants, animal, man and monuments and their Control measures, Air quality standards.
- Water pollution, types and major sources of water pollutants, effects of water pollutants on physico-chemical and biological properties of water bodies, process and control of eutrophication, water born diseases with special reference to water pollution.
- Types and major sources of soil pollutants, effects of soil pollutants on fertility and biological properties of soil.
- Major sources of noise pollution, effects of noise on human health.
- Anthropogenic and other biotic activities grazing, burning and mining etc. and their impact on environment and agriculture, effect of industrialization on environment.
- Introduction to global environmental problems viz: acid rain, ozone depletion, green house gases, Global warming and climatic changes.
- Solid waste disposal and its effects on surrounding environment and management, waste management in domestic, industrial and urban areas, energy generation from wastes.

Part-B

- Introduction and scope of environmental management, environmental ethics and dharma of ecology.
- Basic concepts of sustainable development, industrial ecology and recycling industry.
- Basic environmental laws and acts viz: Environmental protection Act, Air Act, Water Act.
- National and international Environmental conservation strategies and organizations.
- Population and Environment, concept of carrying capacity and population regulation.
- Natural Disasters: causes and effects of cyclone, tornadoes, earthquake, avalanches, land slides and volcanoes, disaster warning, mitigation, preparedness and management.
- Environmental education and awareness, concept and practice of restoration ecology.
- Current Environmental issues and priorities in India for environmental management.

Animal Husbandry and Vet. Science

Paper-I

Time - 3.00 hrs
M.M. - 200

Section-A

Livestock industry - its scope and potential.

Human population in relation to wild life.

Significance of wild life.

Animal Genetics and Breeding

Animal Genetics: Mendelian inheritance, Expression of genes, linkage and crossing over, Sex influenced and sex linked characters. Chromosomal aberration and gene structure, DNA as genetic material, recombinant DNA technology, mutation Quantitative vs Qualitative traits. Forces changing gene frequency.

Animal Breeding: Breeding systems-Inbreeding, out breeding, up grading, hybridization, Cross breeding and out crossing system, selection and their merits, Genetic improvement of cattle, buffaloes, sheep, goat, swine, horses, Poultry and wild animals.

Adaptation to the environment

Thermal balance in animals, direct and indirect effects of weather on animals, Loss of water from body, Growth rate and body weight. Photo sensitive disorder.

Section-B

Animal diseases:

Immunity and vaccination: Principles and method of immunization of animals against specific diseases.

Herd immunity, disease free zone, zero disease concept.

Diseases of cattle, Cow, Buffalo, sheep, goats and wild animals-Etiology symptoms, diagnosis, prevention, control and treatment of Antrax, Haemorrhagic Septicaemia, Black quarter, mastitis, tuberculosis, John's disease, foot and mouth disease, Rinder pest, Rabies, Trypnosomiasis, milk fever and trympanitis, diseases of newly born calf. Disease of poultry - Etiology Symtoms, diagnosis, prevention, control and treatment of Ranikhet disease, Fowl pox, Anian leucosis complex, Marek's diseases and Gumboro Disease.

Diseases of swine- swine fever, and hog cholera, diseases of Dog- Canine distemper, Parvo disease, Rabies in pets in relation to human health.

Veterinary Public Health- Zoonosis and zoonotic disease. Veterinary Jurisprudence- rule and regulations for improvement of animals, quality and prevention of animal disease, Materials and methods for collection and samples for veterolegal investigation.

Extention- Principles of extention, different methods adopted to educate the farmers under rural conditions.

Generation of technology- Its transfer and feed back. Problems and constrains in transfer of technology Animal husbandry programmes for rural development.

Animal Husbandry and Vet. Science

Paper-II

Time - 3.00 hrs.
M.M.- 200

Section-A

A- Animal Nutrition: General nutritional considerations, Energy and Protein nutrition, Mineral and vitamin nutrition, Hormones and additives. Evaluation of nutritional value of feeds. Ruminant and non-ruminant nutrition of animals. Meeting nutritional requirement of various classes of animals. Digestion, metabolism and absorption of nutrients in different types of animals grazing habit and food intake.

B- Animal Physiology

Physiological mechanisms and livestock product, Growth rate & animals production. Nervous and hormonal controlling mechanism, Physiology of Reproduction. Lactation and egg laying. Physiology of digestive system of various classes of animals including wild animals, Semen evaluation, preservation & artificial insemination in various classes of animals.

Section-B

A- Livestock production & Management-

General care and management of livestock - Cattle, buffalo, Goats, Sheep, Pigs and Poultry. General care and management of wild animals. Feeding and management of livestock and wild animals and under drought, Flood and other natural disaster.

Classification, grading and marketing of livestock and their products.

Milk and milk products-

Milk-Collection, transportation of raw milk, quality testing and grading of raw milk, milk pasteurization, standardization, & Homogenization. Reconstituted and recombined milk.

Milk Product technology- Production, Processing, Storage, distribution and marketing of milk products such as butter, Ghee, Khoa, Chhena, Cheese, condensed and dried milk, Ice-cream, yoghurt, Dahi and Srikhand and their testing and grading, BIS specification, legal standards, quality control and nutritive properties of various milk products.

Milk by product technology - whey products, butter milk, Lactose, and casein.

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