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NOTIFICATION

THE MIZORAM CIVIL SERVICE (COMPETITIVE EXAMINATION) REGULATIONS, 2007

NO.A.12024/1/2004-P&AR(CSW), the 3rd August,2007. In pursuance of Rule 8(a) and 9(a) of the Mizoram Civil Service Rules, 2000 as amended in 2002 and in consultation with the Mizoram Public Service Commission, the Governor of Mizoram is pleased to make the following regulations, namely,

1. **SHORT TITLE AND COMMENCEMENT :**

- (i) These Regulations may be called the Mizoram Civil Service (Competitive Examination) Regulations, 2007.
- (ii) They shall come into force from the date of publication in the Mizoram Gazette.

2. **DEFINITIONS :** In these regulations, unless the context otherwise requires :-

- (a) 'Constitution' means the Constitution of India.
- (b) 'Commission' means the Mizoram Public Service Commission.
- (c) 'Examination' means a Competitive Examination for recruitment to the Junior Grade of the Service.
- (d) 'Government' means the State Government of Mizoram.
- (e) 'Governor' means the Governor of Mizoram.
- (f) 'List' means the list of candidates prepared by the Commission under regulation 3(iv) of these regulations.
- (g) 'Service' means the Mizoram Civil Service.
- (h) 'Schedule' means the Schedule appended to these regulations.
- (i) 'Scheduled Castes' and 'Scheduled Tribes' shall have the same meanings as are assigned to them respectively by clauses (24) and (25) of Article 366 of the Constitution.
- (j) 'Vacancy' means vacancy in the Junior Grade of the Service to be filled up by recruitment through competitive examination.

3. HOLDING OF EXAMINATION :

- (i) The Examination shall be conducted by the Commission in accordance with these regulations and syllabi specified in the First Schedule, at such intervals as the Government determine.
- (ii) Candidates seeking admission to the examination must apply to the Commission in the application form prescribed in the Second Schedule.
- (iii) The dates on which and the places at which the examination shall be held shall be fixed by the Commission.
- (iv) The Commission shall prepare a list of all candidates qualified in the examination in order of merit and if two or more candidates obtained equal marks, the Commission shall arrange them in order of their relative merit which shall be determined in accordance with the general suitability of the candidates for appointment to the Service. The list shall be forwarded to the government for making appointment to the Service and be published in the Mizoram Gazette.

4. CONDITIONS OF ELIGIBILITY : In order to be eligible to compete at the examinations, a candidates must satisfy the following conditions, namely :-

- (i) NATIONALITY : He must be a citizen of India as defined in Article 5-7 of the Constitution.

- (ii) AGE LIMITS : He must have attained the age of 21 years but must not have exceeded the age of 35 years on the first day of the month in which the examination is held..

Provided that the upper age limit may be relaxed upto a maximum of five years in respect of candidates belonging to the Scheduled Castes or Scheduled Tribes.

Provided further that the upper age limit may be relaxed upto a maximum of three years in the case of defence service personnel disabled in operations during hostilities with any foreign country or in a disturbed area and released as a consequence thereof, and upto a maximum of eight years in the case of such persons who belong to the Scheduled Castes or Scheduled Tribes.

- (iii). EDUCATIONAL QUALIFICATIONS : a candidates must hold at least a degree of any of the Universities incorporated by an Act the Central or State Legislature in India or other Educational Institutions established by an Act of Parliament or declared to be deemed as Universities under section 3 of the University Grants Commission Act, 1956, or a foreign Universities approved by the Central Government.

Provided that candidates who have appeared at such examinations the passing of which would render them educationally qualified for the examination, but have not been informed of the result or have not been declared at the time of submission of application, may be eligible for admission to the examination. All such candidates included in the list prepared by the Commission under regulations 3 (iv) shall be required to produce proof of passing the requisite examination at the time of interview before the Selection Board/Committee failing which such candidates will not be appointed to the service

- (iv) FEES : A candidate must pay the fees prescribed by the Commission.

5. DISQUALIFICATION FOR ADMISSION : Any attempt on the part of a candidate to obtain support for his candidature by any means may be held by the Commission to disqualify him for admission to the examination and the decision of the Commission as to the eligibility or otherwise of a candidate for admission to the examination shall be final.

6. **APPOINTMENT FROM THE LIST :** Subject to the provision of regulations 4, 7 and 8 candidates will be considered for appointment to the available vacancies in the order in which their names appear in the list.
7. **DISCIPLINARY ACTION :** A candidate who is or have been declared by the Commission to be guilty of -
 - (i) Obtaining support for his candidature by any means, or
 - (ii) Impersonating, or
 - (iii) Procuring impersonation by any person, or
 - (iv) Submitting fabricated document(s) which have been tampered with, or
 - (v) Making statement(s) which are incorrect or false or suppressing material information, or
 - (vi) Resorting to any other irregular or improper means in connection with his candidature for the examination, or
 - (vii) Using unfair means during the examination, or
 - (viii) Bring in any form of communication system like cellular phones etc. inside the examination hall, or
 - (ix) Writing irrelevant matter including obscene language or pornographic matter in the answer script (s), or
 - (x) Misbehaving in any other manner in the examination shall during examination or
 - (xi) Harassing or inflicting bodily harm to the staff employed by the Commission for the conduct of the examination, shall be liable-
 - (a) to be disqualified by the Commission or the examination for which he his a candidate, or
 - (b) to be debarred either permanently or for a specific period-
 - (i) by the Commission form any examination or selection held by them,
 - (ii) by the Government from any employment under it, and
 - (c) if the candidate is already in service under the Government to disciplinary action under appropriate rules.
8. **DISQUALIFICATION FOR APPOINTMENT ON MEDICAL GROUND :**

No candidates shall be appointed to the service who, after such medical examination as the Government may prescribe, is not found to be in good mental or bodily health and free from any mental or physical defect likely to interfere with the discharge of the duties of the service.
9. **INCLUSION IN THE LIST CONFERS NO RIGHT TO APPOINTMENT :**

The inclusion of a candidate's name in the list confers no right to appointment unless the Government is satisfied, after such enquiry as may be considered necessary, that for appointment to the Service.
10.
 - (a) The Examination shall comprise of written examination and interview. The written examination will consist of three compulsory subjects and two optional subjects as listed under regulation 11.
 - (b) There will be one paper in General English and General Essay carrying 100 marks. All other subjects will consist of two papers carrying 100 marks each.
 - (c) Interview will also carry 100 marks.
 - (d) Each paper will be of three hours, duration.
 - (e) The question papers for the examination will be of conventional (essay) type and will be set in English (for compulsory and optional subjects) and Mizo (for Mizo papers only)
 - (f) A candidate must write the answer papers in his own hand, and under no circumstances will be allowed to take the help of a scribe to write the answer papers for him, except in case of a blind candidate.

11. A. COMPULSORY SUBJECTS :

- (i) General English
- (ii) General Studies Paper I & II
- (iii) General Essay

B. OPTIONAL SUBJECTS : (PAPER I & II)

- | | |
|--|-------------------------------|
| (i) Botany | (ii) Chemistry |
| (iii) Commerce & Accountancy | (iv) Economics |
| (v) Education | (vi) English |
| (vii) Forestry | (viii) Geography |
| (ix) Geology | (x) History |
| (xi) Home Science | (xii) Law |
| (xiii) Mathematics | (xiv) Mizo |
| (xv) Philosophy | (xvi) Physics |
| (xvii) Political Science & International Relations | (xviii) Psychology |
| (xix) Public Administration | (xx) Sociology |
| (xxi) Zoology | (xxii) Anthropology |
| (xxiii) Agriculture | (xxiv) Civil Engineering |
| (xxv) Electrical Engineering | (xxvi) Mechanical Engineering |
| (xxvii) Statistics. | (xxviii) Medical Science |
| (xxix) Animal Husbandry & Veterinary Science. | |

12. Notwithstanding anything contained in regulations 11 and 12, a candidate shall not be allowed to offer the following combinations of subjects, namely :-
- (a) Political Science & International Relations and Public Administration.
 - (b) Education and Psychology.
 - (c) Anthropology and Sociology.
 - (d) Mathematics and Statistics.
 - (e) Agriculture and Animal Husbandry & Veterinary Science.
 - (f) Of the Engineering subjects viz., Civil Engineering, Electrical Engineering, and Mechanical Engineering- not more than one subject.
13. **INTERPRETATIONS :** If any question arises as to the interpretation of these regulations, it shall be decided by the Government in consultation with the Commission.
14. **REPEAL & SAVING :** All regulations corresponding to the matters covered by these regulations and in force immediately before the commencement of these regulations stand hereby repealed from the date of commencement of these regulations.
- Provided that any order made or any action taken under the regulations so repealed shall be deemed to have been made or taken under the corresponding provisions of these regulations.

By order of the Governor,

(C.ROPIANGA)

Secretary to the Govt. of Mizoram,
Department of Personnel & Administrative Reforms,
Civil Service Wing.

SCHEDULE - 1
SYLLABUS
A. COMPULSORY SUBJECT

1. GENERAL ENGLISH

The aim of the paper is to test the candidate's ability to read and understanding serious discursive prose and to express his ideas clearly and correctly in English/Indian language concerned. The pattern of questions would be broadly as follows :-

- (i) Comprehension of given passages
- (ii) Precis writing
- (iii) Usage and Vocabulary
- (iv) Short Essay

2. GENERAL STUDIES

General studies paper I and Paper II will cover the following areas of knowledge :

PAPER I

- (1) Modern History of India and Indian Culture
- (2) Current events of national and international importance
- (3) Statistical analysis, graphs and diagrams

PAPER II

- (1) Indian Polity
- (2) Indian economy and Geography of India and
- (3) The role and impact of science and technology in the development of India.

In paper I, Modern 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, Nehru and Cultural heritage and traditional practices in Mizoram. The part relating to statistical analysis, graphs and diagrams will include exercise to test the candidate's ability to draw common sense, conclusions from information presented in statistical, graphical or diagrammatical form and to point out deficiencies, limitations or inconsistencies therein. In paper II, the part relating to Indian Polity will include questions on the political system in India. In the part pertaining to the Indian Economy and Geography of India, questions will be put on planning in India and the Physical economic and social geography of India. In the third part relating to the role and impact of science and technology in the development of India, questions will be asked to test the candidate's awareness of the role and impact of science and technology in India, emphasis will be on applied aspects.

3. GENERAL ESSAY :

B. OPTIONAL SUBJECTS**BOTANY****PAPER I**

1. Microbiology, viruses, bacteria, plasmids-structure and reproduction, General account of infection and immunology. Microbes in agriculture, industry & medicine and air, soil & water. Control of pollution using micro-organism.
2. Pathology : Important plants diseases in India caused by viruses, bacteria, mycoplasma, fungi and nematodes. Modes of infection, dissemination, physiology and parasitism and methods of control, Mechanism of action biocides, Fungal toxins,
3. Cryptogams : Structure and reproduction from evolutionary aspect and ecology and economic importance of algae, fungi, bryophytes and pteridophytes, principal distribution in India.
4. Phanerogams : Anatomy of wood, secondary growth Anatomy of C2 and C plants, stomatal types Embryology, barriers to sexual incompatibility. Seed structure, Apomixis and polyembryony. Polynology and its applications. Comparison of systems of classification of angiosperms. Modern trends in biosystematics, Taxonomic and economic importance of Cycadaceae, Pinaceae, Gnetabes, Magnoliaceae, Ranunculaceae, Cruciferae, Rosaceae, Leguminosae, Euphorbiaceae, Malvaceae, Dipterocarpaceae, Umbelliferae, Asclepiaceae, Verbanaceae, Solanceae, Rubiaceae, Cucurbitaceae Composite, Gramineae, Plame, Liliaceae, Musaceae and Orchidaceae.
5. Morphogenesis : Polarity, symmetry and totipotency. Differentiation and differentiation of cells and organs. Factors of Morphogenesis. Methodology and applications of cell, tissues, organ, and protoplast cultures from vegetative and reproductive parts, Somatic hybrids.

BOTANY**PAPER II**

1. Cell Biology : Scope and perspective. General knowledge of modern tools and techniques in the study of cytology. Prokaryotic and eukaryotic cells structural and ultrastructural details. Functions of organelles including membranes. Detailed study of mitosis and meiosis. Numerical and structural variations in chromosome and their significance. Study of polyrene and lampbrush chromosomes-structure, behaviour and cytological significance.
2. Genetics and Evolutions : Development of genetics and gene concepts. Structure and role of nucleic acids in protein synthesis and reproduction. Genetic code and regulation of gene expression. Gene amplification. Mutation and evolution. Multiple factors, linkage and crossing over. Methods of gene mapping. Sex chromosomes and sex-linked inheritance. Male sterility, its significance in plant breeding. Cytoplasmic inheritance. Elements of human genetics. Standard deviation and Chi-square analysis. Genetic engineering. Organic evolution-evidence mechanism and theories.
3. Physiology and Biochemistry : Detailed study of water relations. Mineral nutrition and ion/transport. Mineral deficiencies. Photosynthesis-mechanism and importance, Photosystems I and II, photorespiration. Respiration and fermentation. Nitrogen fixation and nitrogen metabolism, Protein synthesis, Enzymes, Importance of secondary metabolites. Pigments as photoreceptors,

photoperiodism, flowering. Growth indices, growth movements, Senescence. Growth Substances-their chemical nature, role and application in agri-horticulture. Agrochemicals. Stress physiology Vernalization Fruit and seed physiology-dormancy, storage and germination of seed. Parthenocarpy, fruit ripening.

4. Ecology : Ecological factors. Concept and dynamics of Community, succession. Concepts of biospheres. Conservation of ecosystems. Pollution and its control Forest types of India. Afforestation, deforestation and social forestry. Endangered plants.
4. Economic Botany : Origin of cultivated plants. Study of plants as sources of food, fodder and forage, fatty oils, wood and timber, fibre, paper, rubber, beverages, alcohol, drugs, narcotics, resins and gums, essential oils, dyes, mucilage, insecticides and pesticides. Plant indicators. Ornamental plants. Energy plantation.

CHEMISTRY PAPER I

1. Atomic structure & chemical bonding : Quantum theory, Heisenberg's uncertainty principle, Schrodinger wave equation) time independent). Interpretation of wave function, particle in a one-dimensional box, quantum numbers, hydrogen atom wave functions, Shapes of s.p. and d orbitals. Ionic bond, Lattice energy, Born-Haber cycle, Fajans rule, dipole moment, characteristics of ionic compounds, electronegativity differences. Covalent bond and its general characteristics: valence bond approach. Concept of resonance & resonance energy. Electronic configuration of H_2 , H_2N_2 , O_2 , F_2 , N_2 , CO and HF molecules in terms of molecular orbital approach, Sigma and pi bonds. Bond order, bond strength & bond length.
2. Thermodynamics : Work heat and energy. First law of thermodynamics Enthalpy, heat capacity. Relationship between C_p and C_v . Laws of thermochemistry. Kirchoff's equation. Spontaneous and non-spontaneous change. Second law of thermodynamics. Entropy changes in gases for reversible and irreversible processes. Third law of thermodynamics. Free energy, variations of free energy of a gas with temperature, pressure and volume. Gibbs-Helmholtz equation. Chemical potential. Thermodynamic criteria for equilibrium. Free energy change in Chemical to action and equilibrium constant. Effect of temperature and pressure on chemical equilibrium. Calculation of equilibrium constants from thermodynamic measurements.
3. Solid State : Forms of solids, law of constancy of interfacial angles. Crystal systems and crystal classes (crystallographic groups). Designation of crystal systems structure and unit cell. Laws of rational indices. Bragg's law. X-ray diffraction by crystals Defects in crystals. Elementary study of liquid crystals.
4. Chemicals kinetics : Order and molecularity of a reaction. Rate of equations (differential & integrated forms) of zero, first and second order reactions. Half life of a reaction. Effects of temperature, pressure and catalysts on reaction rates. Collision theory of reaction rates of bimolecular reactions. Absolute reaction rate theory. Kinetics of polymerization and photo chemical reactions.
5. Electrochemistry : Limitations of Arrhenius theory of dissociation, Debye- Huckel theory of strong electrolytes and its quantitative treatment. Electrolytic conductance theory and theory of activity coefficients. Derivation of limiting laws for various equilibria and transport properties of electrolyte solutions.

6. Concentration cells, liquid junction potential, application of c.m.f. measurements of fuel cells.
7. *Photochemistry* : Absorption of light. Lambert-Beer's law. Law of photochemistry. Quantum efficiency. Reasons for high and low quantum yields. Photoelectric cells.
8. *General Chemistry of 'd' block elements* :
 - (a) Electronic configuration, Introduction to theories of bonding in transition metal complexes, Crystal field Theory and its modifications; applications of the theories in the explanation of magnetism and electronic spectra of metal complexes.
 - (b) Metal Carbonyls; Cyclopentadienyl, Olefin and Acetylene complexes.
 - (c) Compounds with metal-metal bonds and atom clusters.
9. General Chemistry of 'f' block elements: Lanthanides and actinides; Separations, Oxidation states, magnetic and spectral properties.
10. Reactions in non-aqueous solvents (liquid ammonia and sulphur dioxide)

CHEMISTRY

PAPER II

1. Reaction Mechanism : General methods (both kinetic and non-kinetic) of study of mechanisms of organic reactions illustrated by examples.

 Formation and stability of reactive intermediates (carbonations, carbanions, free radicals, carbenes, nitrenes and benzenes).

 SN1 and SN2 mechanism, H1 E2 and E1cB eliminations, cis and trans addition to carbon to carbon double bonds-mechanism of addition to carbon-oxygen double bonds. Michael addition-addition to conjugated carbon-carbon double bonds-aromatic electrophilic and nucleophilic substitutions-allylic and benzylic substitutions.
2. Pericyclic reactions : Classification and examples an elementary study of Woodward-Hoffman rules of the pericyclic reactions.
3. Chemistry of the following name reactions : Aldol condensation, Claisen condensation, Dieckmann reaction, Perkin reaction, Reimer-Tiemann reaction, Cannizzaro reaction.
4. Polymeric systems :
 - (a) Physical Chemistry of polymers; End group analysis, Sedimentation, Light Scattering and Viscosity of Polymers.
 - (b) Polyethylene, Polystyrene, Polyvinyl Chloride, Ziegler Natta Catalysis, Nylon, Terylene.
 - (c) Inorganic Polymeric systems, Phosphonitric halide compounds; silicones; Borazines.
 Friedel-Craft reaction, Reformatsky reaction, pinacol-pinacolone, Wagner-Meerwein and Beckmann rearrangements, and their mechanisms-uses of the following reagents in organic synthesis : O_3 O_4 HIO , NBS, diborane, Na-liquid ammonia $NaBH_4$, $LiAlH_4$
5. Photochemical reactions of organic and inorganic compounds : Types of reactions and examples and synthetic uses - Methods used in structure determination, Principles and application of UV-visible, IR ^{1}H NMR and mass spectra for structure determination of simple organic and inorganic molecules.

6. Molecular Structural determinations : Principles and Applications to simple organic and inorganic Molecules.

- (i) Rotational spectra of diatomic molecules (Infrared and Raman), isotopic substitutions and rotational constants.
- (ii) Vibrational spectra of a diatomic linear symmetric, linear symmetric and bent triatomic molecules (Infrared and Raman).
- (iii) Specificity of the functional groups (Infrared and Raman).
- (iv) Electronic Spectra - Singlet and triplet states, conjugated double bonds, a b unsaturated carbonyl compounds
- (v) Nuclear magnetic Resonance : Chemical shifts, spin-spin coupling.
- (vi) Electron spin Resonance : Study of inorganic complexes and free radicals.

COMMERCE AND ACCOUNTANCY

PAPER I:

ACCOUNTING AND FINANCE

Part- I : Accounting, Auditing and Taxation :

Accounting and financial information system-impact of behavioural sciences. Methods of accounting of changing price levels with particular reference to Current Purchasing Power (CPP) accounting- Advanced problems of company accounts - Amalgamation absorption and reconstruction of companies. Valuation of shares and goodwill-Controllership functions- property control legal and management. Important provisions of the Income Tax Act, 1961 – Definition Change of Income Tax Exemptions Depreciation and investment allowance-Simple Problems of computation of income under the various heads and determination of assessable income-Income-tax-authorities.

Nature and functions of Cost-Accounting-Cost classification-Techniques of segregating semivariable costs into fixed and variable components-job costing-FIFO and weighted average methods of calculating equivalent units of production-Reconciliation of cost and financial accounts-marginal costing-Cost-volume profit relationship; Algebraic formulae and graphical representation-shutdown point- Techniques of cost control and cost reduction budgetary control - flexible budgets - Standard costing an variance analysis- Responsibility accounting- bases of charging overheads and their inherent fallacy-costing for pricing decision. Significance of the attest function-Programming the audit work-Valuation and verification of assets, fixed wasting and current assets-Verification of liabilities-Audit of limited companies-appointment status powers, duties and liabilities of the auditor-Auditor's report-Audit of share capital and transfer of shares-Special points in the audit of banking and insurance companies.

Part- II : Business, Finance and Financial Institutions.

Concept and scope of Financial Management-Financial goals of corporations-Capital budgeting; Rules of the thumb and Discounted cash flow approaches-Incorporating uncertainty in investment decisions. Designing an optimal capital structure-Weighted average cost of capital and the controversy surrounding the Modigliani and Miller model, Sources of raising short-term intermediate and long-term finance-Role of public and convertible debentures-Norms and guidelines regarding debt-equity ratios-Determinants of an optional dividend policy-optimising models of James E. Walter and John Liner-forms of dividend payment-Structure of working capital and the variable affecting the level of difference of components-Cash flow approach of forecasting working capital needs- Profiles of working capital in Indian Industries-Credit management and Credit Policy-Consideration of Tax in relation to Financial Planning and cash flow statements.

Organisation and deficiencies of Indian Money Market structure of assets and liabilities of Commercial banks-Achievements and failures of Nationalisation-Regional rural Banks-Recommendations of the Tendon (P.L) Study Group on following of Bank credit, 1976 and their revision by the Chore (K.B) Committee, 1979 - An assessment of the monetary and credit Policies of the Reserve Bank of India-Constituents of the Indian Capital Market-Functions and working of All India term financial institutions (IDBI, IFCI, ICICI and IRCI)- Investment policies of the Life Insurance Corporation of India and the Unit Trust of India - Present state of stock exchanges and their regulation.

Provision of the Negotiable Instruments Act, 1881. Crossings and endorsements with particular reference to statutory protection to the paying and collecting bankers. Salient provision of the Banking Regulation Act, 1949 with regard to chartering, supervision and regulation of banks.

COMMERCE AND ACCOUNTANCY

PAPER – II

ORGANISATION THEORY AND INDUSTRIAL RELATIONS.

Part - I : Organisation Theory.

Nature and concept of Organisation - Organisation goals : Primary and secondary goals, Single and multiple goals, ends means chain-Displacement, succession, expansion and multiplication of goals-Formal organisation, Type, Structure-Line and Staff, functional matrix and project-informal and limitations.

Evolution of Organisation Theory :

Classical, Neo-classical and system approach-Bureaucracy, Nature and basis of power, Sources of power structure and politics-Organisational behaviour as a dynamic system : technical, social and power systems-interrelations and interactions-Perception-Status system. Theoretical and empirical foundation of Maslow, Mc Gregor, Herzberg, Likert, Vroom, Porter and Lawler, Adam-Homan's Model of motivation. Morale and productivity - Leadership : Theories and styles - Management of conflicts in organization-Transactional Analysis Significance of culture to organizations, Limits of rationality-Simon-March approach. Organisational change, adaptation, growth and development-Organisational control and effectiveness.

PART II : Industrial Relations :

Nature and scope of industrial relations, industrial labour in India and its commitment-Theories of unionism -Trade Union movement in India-Growth and structure-Role of outside leadership-Workers education and other problems-Collective bargaining-approaches conditions, limitation and its effectiveness in Indian condition-Workers participation in management; philosophy, rationale, present day state of affairs and its future prospects.

Prevention and settlement of industrial disputes in India : Preventive measures, settlement machinery and other measures in practice-Industrial relations in public enterprises-Absenteeism and labour turn-over in Indian industries-Relative wages and wage differentials, wage policy in India the Bonus issue-International Labour Organisation and India-Role of personnel department in the organization- Executive development, personnel policies, personnel audit and personnel research.

ECONOMICS

PAPER – I

- 1.. The framework of an Economy : National income Accounting.
2. Economic choice : Consumer behaviour and market forms.
3. Investment decisions and determination of income and employment. Marco-economic models of income, distribution and growth.
4. Banking, Objectives and instruments of Central Banking and Credit policies in a planned developing economy.
5. Types of taxes and their impacts on the economy. The impacts of the size and the content of budgets. Objectives and instruments of budgetary and fiscal policy in a planned developing economy.
6. International trade. Tariffs. The rate of exchange. The balance of payment. International monetary and banking institutions.

ECONOMICS

PAPER – II

1. The Indian Economy : Guiding principles of Indian economic policy- Planned growth and distributive justice - Eradication of poverty. The institutional framework of the Indian economy. Federal governmental structure-Agriculture and industrial sectors-Public and private sectors. National income - its sectoral
2. Agriculture Production : Agriculture Policy : lands Reforms, Technological change. Relationship with the Industrial Sector.
3. Industrial Production : Industrial Policy, Public and private sector, Regional distribution. Control of monopolies and monopolistic practices.
4. Pricing Policies for agricultural and industrial outputs Procurement and public Distribution.
5. Budgetary trends and fiscal policy.
6. Monetary and credit trends and policy- Banking and other financial institutions.
7. Foreign trade and the balance of payments.
8. Indian Planning : Objectives, strategy, experience and problems.

EDUCATION

PAPER – I: HUMAN DEVELOPMENT AND EDUCATION

1. *Educational and Psychology* : Nature, Scope and Relationship between Education & Psychology; role of Educational Psychology in the field of Education.
2. *Growth and Development* : Meaning of Growth Development and Maturation, Principles of Growth and Development and their Educational Implications; Physical, Emotional, social, Language and Intellectual Development at various stages with special emphasis on Adolescence period; Piaget's Stages of cognitive Development.
3. *Intelligence and Creative* : Meaning and Nature of Intelligence and Creativity Spearman's and Thurstone's theories of Intelligence; role of Education in the development of creativity.
4. *Equality of Educational Opportunities* : Policy measures and status, Education as an instrument of social change and modernization; Role of Education in value Development.

5. *Learning and Motivation* : Nature of Learning and Motivation; Learning theories of Pavlov, Skinner and Tolman; Transfer of Learning; Role of Motivation in Learning.
6. *Personality and Mental Health* : Concepts of Personality and Mental Health. Types and Trait approaches to personality; Techniques of personality assessment; Adjustment, Mechanisms, Role of Guidance and counseling in the improvement Mechanism, Role of Guidance and Counselling in the improvement of Maladjustment.

EDUCATION

PAPER – II : EDUCATIONAL THOUGHT AND SYSTEMS

1. Legal and Constitutional provision of Education. Role of local bodies, State and Centre in providing education.
2. Contributions to Education of Dewey, Gandhi, Tagore and Montessori;
3. Modern Trends and practices in Education, Educational Technology and Mass Media, International Cooperation in Education, Distance Education and open Learning System, Environmental Education ; National Literacy Mission (NIM).
4. Need and importance of Educational Aims; Immediate and Ultimate aims of Education, Process of Educational planning Budgeting, accounting and auditing in Education.
5. (a) Objectives and curriculum, Organisational set-up Finance and Resource Mobilisation recommended by –
 - (i) Kothari Commission (1964-66)
 - (ii) New Education Policy (1986) and its revised version (1992)
- (b) (i) School without burden (Yash Pal Committee)
- (ii) Education for all (Delhi summit)
- (c) Education in the North-East with special reference to
 - (i) Special cultural and organizational features of tribal communities
 - (ii) Problems and Issues
 - (iii) Role of Education in the modernization of Tribal Communities.

ENGLISH ELECTIVE

PAPER - I : 100 marks.

A detailed literacy study of the Victorian era with special top the works of the following writers :-

1. Alfred Lord Tennyson
2. Robert Browning
3. Matthew Arnold
4. Rosetti
5. Swinburne
6. Thackeray
7. George Eliot
8. Thomas Hardy
9. John Ruskin
10. Thomas
11. John Stuart Mill
12. Walter Pater.

PAPER – II : 100 MARKS.

First-hand reading of the following texts to test critical ability :

- | | |
|--------------------|---|
| 1. Shakespeare | Twelfth Night,
King Lear
The Tempest |
| 2. Milton | Samson Agonistes |
| 3. Jane Austen | Pride and Prejudice |
| 4. Wordsworth | Lyrical Ballads |
| 5. Charles Dickens | Oliver Twist |
| 6. George Eliot | Adam Bede |
| 7. Thomas Hardy | The Return of the Native |
| 8. Yeats | Easter 1916
Sailing to Bysantium
The Tower
The Winding Stair |
| 9. T.S. Eliot | The Wasteland |
| 10. D.H. Lawrence | Sons and Lovers |

FORESTRY

PAPER - I

NOTE : (Candidates will be required to answer 6 questions. There will be 10 questions in Paper I. The candidates will be required to attempt one compulsory question and five from the rest, selecting at least one question each from section A, B and C).

Section A : Silviculture :

General silvicultural principles; ecological and physiological factors influencing vegetation; natural and artificial regeneration of forests; nursery techniques; seed technology collection, storage, pretreatment and germination; establishment and tendings. Silvicultural systems. : Clear felling uniform, shelter wood selection, coppice and conversion systems. Silviculture of some of the economically important species of India such as Cedrus deodara, Pinus roxburghii, Acacia catechu, Acacia auriculiformis, Acacia nilotica, Albizzia spp, artocarpus spp, Bambusa spp, Casuarina equisetifolia, Dalbergia spp, Anogeissus spp, Salmalia/malabarica, Shorea robusta. Tectona grandis, Terminalia spp, Social Forestry objectives, scope, necessity, agro forestry, extension forestry, recreation forestry, peoples participation.

Section B : Forest Mensuration and Management :

Methods of measuring diameter, girth, height and volume of trees, form factor, volume estimation of stand, sampling methods, yield calculation current annual increment, mean annual increment; sample plots, yields and stand tables, scope and objectives of forest inventory, (aerial survey and remote sensing techniques). Forest management objectives and principles, techniques, sustained yield relation, normal forest, growing stock, regulation of yield methods and application, working plans preparation and control.

Section C : Forest Utilisation :

Logging and extraction techniques and principles, transport, storage and sale Minor forest product definition and scope, gums, resins, oleoresins, fibres, oil seeds, nuts rubber, canes, bamboo, medicinal plants, charcoal, apiary, sericulture lac and shellac, tassar silk, katha and Bidi Leaf Collection, Processing and disposal of minor forest products. Wood technology, anatomical, physical and mechanical properties of wood, defects and abnormalities, composite and other wood products, pulp paper and rayon. Saw milling, wood seasoning and preservation.

FORESTRY
PAPER II

(Note : Candidates will be required to answer 6 questions. There will be 10 questions in Paper-II. The candidates will be required to attempt one compulsory and one question each from sections A,B,C,D & E)

Section A : Forest Protection :

Injuries to forests abiotic and biotic, insect, pests and diseases. General forest protection against fire, insect, pests and diseases, biological and chemical controls.

Section B. Forest Ecology and Forest Biology :

Biotic and Abiotic components of forest ecology, forest ecosystems, forest community concepts, vegetation concepts, ecological succession and climax, primary productivity, nutrient cycling and water relations, physiology in stress environments (drought, water logging alkalinity and salinity), composition of forest types, species composition and associations, dendrology, taxonomic classifications, identification of species principles and establishment of herbaria and arboreta. Principles and concepts of tree improvement, methods and techniques, exotics. Ecology and biology of Wildlife, principles and techniques of managements, endangered species, wildlife conservation.

Section C : Forest Economics, Policies and Legislation :

Fundamental principles of forest economics, costs benefits analyses, estimation of demand and supply, assessment and projection of market structures, role of corporate Financing, socio economic analyses of forest productivity and attitudes. History of forest development, Indian Forest Policy of 1894, 1952 and 1988. National Commission on Agriculture report on forestry, Constitution of Wasteland Development Board, Indian Council of Forest Research and Education, forest laws, necessity, general principles, Indian Forest Act, 1927, Forest Conservation Act, 1980, Wildlife (Protection) Act, 1972.

Section D : Forest Surveying and Engineering :

Different methods of survey chain, prismatic, compass, plane table and topographic surveys; area calculation, maps and map reading. Basic principles of forest engineering. Building materials, and construction, Road objects and classification general principles; construction Bridges general principles; objects types, simple design and construction of timber bridges.

Section E : Forest soils and soil Conservation :

Forest Soils : Classification, factors affecting soil formation; physical and chemical properties. Soil Conservation definitional causes of erosion, types of wind and water erosion, conservation and management of eroded areas, windbreaks, shelter belts, fixation of sand dunes, reclamation of alkaline, saline, water logged and other waste lands. Watershed Management Objective and methods.

GEOGRAPHY

PAPER I : Principles of Geography.

Section A : Physical Geography :

1. Geomorphology – Origin and evolution of the earth's crust; earth movements and plate tectonics volcanism; rocks; weathering and erosion; cycle of erosion-Davis and Penck fluvial, glacial and marine and karst landforms; rejuvenated and polycyclic land-forms.

2. Climatology – The atmosphere, its structure and composition, temperature, humidity, precipitation pressure and winds; jet stream, air masses and fronts; cyclones and related phenomena; climatic classification. Koeppen and Thorthwalt; groundwater and hydrological cycle.
3. Soils and Vegetation – Soil genesis, classification and distribution; Biotic successions and major biotic regions of the world with special reference to ecological aspects of savanna and monsoon forest biomes.
4. Oceanography – Ocean bottom relief; salinity, currents and tides; ocean deposits and coral reef, marine resource-biotic mineral, and energy resources and their utilisation.
5. Ecosystem – Ecosystem concept, interrelations of energy flows, water circulation, geomorphic processes, biotic communities and soils, land capability; Man's impact on the ecosystem, global ecological imbalances.

Section B : Human and Economic Geography :

1. Development of Geographical thought – Contributions of European and Arab Geographers. Determinism and possibilism; regional concept, system approach, models and theory, quantitative and behavioural revolutions in geography.
2. Human Geography – emergence of man and races of mankind; cultural evolution of man, Major cultural relays of the world; international migrations, past and present, world population distribution and growth; demographic transition and world population problems.
3. Settlements Geography – Concepts of rural and urban settlements; Origin of urbanization, Rural settlement pattern, central place theory, rank size and primate city distributions; city classifications; urban spheres of influence and the rural urban fringe; the internal structure of cities-theories and cross culture comparisons, problems of urban growth in the world.
4. Political Geography – Concepts of nation and state, frontiers boundaries and buffer zones; concept of heartland and rain land; federalism; political regions of the world; world geopolitics; resources, development and international politics.
5. Economic Geography – World economic development measurement and problems; world resources, their distribution and global problems; world energy crisis, the limits to growth; world agriculture-typology and world agricultural regions theory of agricultural location, diffusion of innovation and agricultural efficiency; world food and nutrition problems; world industry-theory of location of industries, world industrial patterns and problems, world of trade-theory and world patterns.

GEOGRAPHY
PAPER - II
GEOGRAPHY OF INDIA

Physical Aspects - Geoglogical history, physiography and drainage systems, origin and mechanism of the Indian Monsoon, identification and distribution of drought and flood prone areas; soils and vegetation, land capability, schemes of natural physiographic drainage and climate regionalisation.

Human Aspects - Genesis ethnic/racial diversities; tribal areas and their problems; and role of language, religion and culture in the formation of regions; historical perspectives and unity and diversity; population distribution, density, and growth, population problems and policies. Resources conservation and utilization of land mineral, water, biotic and marine resources, man and environment-ecological problems and their management.

Agriculture – The infrastructure, irrigation, power fertilizers, and seeds; institutional factors land holdings, tenure, consolidation and land reforms; agricultural efficiency and productivity, intensity of cropping, crop combinations and agricultural regionalization, green revolution, dry-zone agriculture, and agricultural land use policy; food and nutrition; Rural economy, animal husbandry, social forestry and household industry.

Industry – History of industrial development factors of localization; study of mineral based, agro-based and forest based industries, industrial decentralization and industrial policy; industrial complexes and industrial regionalization, identification of backward areas and rural industrialization.

Transport and Trade – Study of the network of roadways, railways, airways and waterways, competition and complementarity in regional context; passenger and commodity flow, intra and interregional trade and the role of rural market centres.

Settlements - Rural settlement patterns; urban development in India; Census concepts of urban areas, functional and their archical patterns of Indian cities, city regions and the rural-urban fringe; internal structure of Indian cities; town planning slums and urban housing; national urbanization policy.

Regional Development and Planning - Regional policies in Indian Five Years Plan; experience of regional planning in India, multi-level planning state, district and block level planning. Centre State relations and the Constitutional framework for multi-level planning Regionalisation for planning for metropolitan regions; tribal and hill areas, drought prone areas command areas and river basins; regional disparities in development in India.

Political Aspects – Geographical basis of Indian federalism, state reorganization; regional consciousness and national integration; the international boundary of India and relate issues; India an geopolitics of the Indian Ocean area.

GEOLOGY

PAPER I

(General Geology, Geomorphology, Structural Geology, Palaeontology and Stratigraphy)

1. *General Geology* : Energy in relation to Geo-dynamic activities, Origin and interior of the Earth, Dating of rocks by various methods and age of the Earth, Volcanoes-causes and products; volcanic belts. Earthquakes causes, geological effect and distribution; relation to volcanic belts.

Geosynclines and their classification. Island arcs, deep sea trenches and mid-ocean ridges, sea-floor spreading and plate tectonics, Isostasy Mountains-types and origin. Brief ideas about continental drift, Origin of continents and oceans. Radioactivity and its application to geological problems.

2. *Geomorphology* : Basic concepts and significance. Geomorphic processes and parameters. Geomorphic cycles and their interpretation. Relief features; topography and its relation to structures and lithology. Major landforms Drainage systems. Geomorphic features of Indian sub-continent.
3. *Structural Geology* : Stress and strain ellipsoid, and rock deformation. Mechanics of folding and faulting. Linear and planer structures and their genetic Significance. Petrofabric analysis, its graphic representation and application to geological problems. Tectonics frame-work of India.
4. *Palaeontology* : Micro, and Macro-fossils, Modes of preservation and utility of fossils, General idea about classification and nomenclature. Organic evolution and the bearing of Palaeontological studies on it.

Morphology, classification and geological history including evolutionary trends of brachiopods, bivalves, gastropods, ammonoids, trilobites, echinoids and corals. Principal groups of vertebrates and their main morphological characters, Vertebrates life through ages; dinosaurs; Siwalik vertebrates. Detailed study of horses, elephants and man, Gondwana flora and its importance.

Types of micro fossils and their significance with special reference to petroleum exploration.

5. *Stratigraphy* : Principles of Stratigraphy. Stratigraphic classification and nomenclature. Standards stratigraphical scale, Detailed study of various geological systems of Indian sub-continent. Boundary problems in Stratigraphy. Correlation of the major Indian formation with their world equivalents. An outline of the Stratigraphy of various geological systems in their type areas. Brief study of climates and igneous activities in Indian sub-continent during geological past. Paleographic reconstructions.

GEOLOGY **PAPER II**

(Crystallography, Mineralogy, Petrology and Economic Geology)

1. *Crystallography* : Crystalline and non-crystalline substances. Special groups. Lattice symmetry. Classification of crystals into 32 classes of symmetry. International system of crystallographic notation. Use of stereographic projections to represent crystal symmetry. Twinning and twin laws. Crystal, irregularities. Application of X-Rays for crystal for crystal studies.
2. *Optical Mineralogy* : General principles of optics Isotropism and anisotropism concepts of optical indicatrix. Pleochroism; interference colours and extinction. Optic orientation in crystals. Dispersion, optical accessories.
3. *Mineralogy* : Elements of crystal chemistry-types of bondings, Ionic radii coordination number Isomorphism polymorphism & pseudomorphism. Structural classification of silicates. Detailed study of rock forming mineral, their physical, chemical and optical properties, and uses, if any-Study of the alteration products of these minerals.
4. *Petrology* : Magma, its generation, nature and composition. Simple phase diagrams of binary and ternary systems, and their significance, Bowen's Reaction Principle, magmatic differentiation, assimilation.

Textures and structures, and their petrogenetic significance. Classification of igneous rocks. Petrography and Petrogenesis of important rock-types of India; granites and granites charnockites. Deccan basalts. Processes of formation of sedimentary rock. Diagenesis and lithification. Textures and their significance.

Classification of Sedimentary rocks, classic and non-classic. Heavy mineral and their significance. Elementary concept of depositional environments, sedimentary facies and provenance. Petrography of common rock types.

Variable of metamorphism. Types of metamorphism. Metamorphic grade, zones and facies ACE AKE and AEM diagrams. Textures, structures and nomenclature of metamorphic rocks. Petrography and petrogenesis of important rock types.

5. *Economic Geology* : Concept of ore, ore mineral and gangue; tenor of ores. Processes of formation of mineral deposits. Common forms and structures of ore deposits. Classification of ore deposits. Control of ore deposition Metallogenic epochs. Study of important metallic and non-metallic deposits, oil and natural gas fields, and coal fields of India. Mineral wealth of India Mineral economics. National Mineral Policy. Conservation and utilization of minerals.
6. *Applied Geology* : Essentials of prospecting and exploration techniques. Principal methods of mining, sampling, ore-dressing and beneficiation. Application of Geology in Engineering works. Elements of soil and groundwater geology and geochemistry. Use of aerial photographs in geological investigations.

HISTORY PAPER – I

SECTION A : HISTORY OF INDIA (Down to A.D. 750)

1. The Indus Civilisation : Origins : Extent : Characteristic features; Major cities. Trade and contacts, causes of decline survival and continuity.
2. The Vedic Age : Vedic Literature Geographical area known to Vedic are known to Vedic Texts. Differences and similarities between Indus Civilisation and Vedic Culture Political, Social and Economic patterns. Major Religious ideas and rituals.
3. The Pre-Maurya Period : Religious movements (Jainism, Buddhism and other sects). Social and Economic Conditions Republic and growth of Magadha Imperialism.
4. The Maurya Empire : Sources, rise, extent and fall of the empire, Administration. Social Economic Conditions, Ashoka's Policy and reforms Art.
5. The Post-Maurya Period (200 B.C.–300 A.D) : Principal dynasties in Northern and Southern India Economy and Society : Sanskrit, Prakrit and Tamil Religion (Rise of Mahayana and their stick cults). Art (Gandhara, Mathura and other schools). Contacts with Central Asia.
6. The Gupta Age : Rise and fall of the Gupta Empire, the Vakatas, Administration Society, Economy, Literature, Art and Religion. Contacts with South East Asia.

7. Post-Gupta Period (B.C. 500-750 A.D) : Pushyabhytis, The Mukharis. The later Guptas. Harshavardhana and his times. Chalukyas of Badami. The Pallavas, society, Administration and art. The Arab conquest.
8. General review of Science and Technology, Education and Learning.

SECTION B : MEDIEVAL INDIA (750 A.D. to 1765 A.D)

INDIA : 750 A.D. to 1200 A.D)

1. Political and Social conditions; the Rajput their Polity and social structure, land structure, and its impact on society.
2. Trade and Commerce.
3. Art, Religion and Philosophy; Sankaracharya
4. Maritime Activities; contacts with the Arabs, Mutual, Cultural impacts.
5. Rashtrakutas, their role in History-Contribution to Art and Culture. The Chola Empire Local Self-Government, features of the Indian Village System; Society, Economy, Art and Learning in the South
6. Indian society on the eve of Mahmud of Ghazni's Campaigns; Al-Biruni's Observations.

INDIA : 1200-1765

7. Foundation of the Delhi Sultanate in Northern India; causes and circumstances; its impact on the Indian society.
8. Khilji Imperialism, significance and Implications, Administrative and Economic regulations and their impact on State and the people.
9. New Orientation of State Policies and Administrative Principles under Muhammad bin Tughlaq; Religious Policy and Public works of Firoz Shah.
10. Disintegration of the Delhi Sultanate: Causes and its effects on the Indian Policy and society.
11. Nature and character of State : Political ideas and institutions. Agrarian structure and relations, growth of Urban Centres, Trade and Commerce, Conditions of artisans and peasants, new Crafts Industry and Technology. Indian Medicines.
12. Influence of Islam on Indian Culture: Muslim mystic movements, nature and significance of Bhakti saints. Maharashtra Dharma, role of the Vaisnave revivalist Movement; Social and Religious Significance of the Chaitanya Movement, impact of Hindu society on Muslim Social life.
13. The Vijayanagar Empire : Its origin and growth; contribution to art; literature and culture, social and economic conditions, system of administration; break-up of the Vijaynagar Empire,
14. Sources of History : Important Chronicles. Inscriptions and Travellers Accounts.
15. Establishment of Mughal empire in Northern India : political and social conditions in Hindustan on the eve of the Babur's invasion : Babur and Humayun. Establishment of the Portuguese control in the Indian Ocean, its political and economic consequences.
16. Sur Administration, political revenue and military administration.
17. Expansion of the Mughal empire under Akbar : political unification; new concept of monarchy under Akbar : Akbar's religio-political outlook; Relations with the non-Muslim.
18. Growth of regional languages and literature during the medieval period. Development of art and architecture.
19. Political ideas and institutions; Nature of the Mughal State, Land Revenue administration; The Mansabdari and the jagridari systems, the land structure and the role of Zamindars, agrarian relations, the military organization.

20. Aurangzeb's religious policy, expansion of the Mughal Empire in Deccan; Revolts against Aurangzeb-Character and consequences.
21. Growth of urban centres; industrial; economy-urban and rural : Foreign Trade and Commerce. The Mughals and the European trading companies.
22. Hindu Muslim relation; trends of integration; composite culture (16th to 18th centuries).
23. Rise of Shivaji : his conflict with the Mughals, administration of Shivaji : expansion of the Maratha power under the Peshwas (1707-1761). Maratha political structure under the first three Peshwas, Chauth and Sardeshmukhi, Third Battle of Panipat, cause and effects; emergence of the Maratha confederacy, its structure and role.
24. Disintegration of the Mughal empire, emergence of the new Regional States.

HISTORY

PAPER - II

Section – A : MODERN INDIA (1757-1947)

1. Historical forces and Factors which led to the British conquest of India with special references to Bengal, Maharashtra and Sind; Resistance of Indian powers and causes of their failure.
2. Evolution of British Paramountcy over princely States.
3. Stages of colonialism and changes in Administrative and policies. Revenue, Judicial and Social and Educational and their linkages with British colonial interests.
4. British economic policies and their impact. Commercialisation of agriculture, Rural indebtedness, Growth of Agriculture labour, Destruction of handicraft industries, Drain of Wealth, Growth of modern industry and rise of a capitalist class. Activities of the Christian Missions.
5. Efforts at regeneration of Indian society- Socio-religious movements, Social, religious, political and economic ideas of the reformers and their vision of future, nature and limitation of 19th Century "Renaissance," caste movements in general with special reference to south India and Maharashtra, tribal revolts, specially in Central and Eastern India.
6. Civil rebellions, Revolt of 1857, Civil Rebellions and peasant Revolts with special reference to Indigo revolt, Deccan riots and Mappila Uprising.
7. Rise and Growth of Indian National Movement. Social basis of Indian nationalism policies. Programme of the early nationalists and militant nationalists, militant revolutionary group terrorists. Rise and Growth of communalism. Emergence of Gandhiji in Indian politics and his techniques of mass mobilisation: Non-cooperation, Civil Disobedience and Quit India Movement; Trade Union and peasant movements State(s) people movements, Rise and growth of Left-wing within the Congress Socialists and communists; British official response to National Movement Attitude of the congress to Constitutional changes 1909-1935. Indian National Army Naval mutiny of 1946. The partition of India and Achievement of Freedom.

Section – B : WORLD HISTORY (1500-1950)

- A. Geographical discoveries-decline of feudalism, Beginning of Capitalism. Renaissance and reformation in Europe. The New absolute monarchies-Emergence of the Nation State. Commercial Revolution in Western Europe- Mercantilism. Growth of Parliamentary institutions in England. The thirty Year's war. Its significance in European History, ascendancy of France.
- B. The emergence of a scientific view of the World. The age of Enlightenment. The American revolution- its significance. The French revolution and Napoleonic Era (1789-1815). Its significance in World History. The growth of liberalism and democracy in Western Europe (1815-

1914). Scientific and Technological background to the Industrial revolution-Stages of the Industrial Revolution in Europe. Socialist and Labour Movements in Europe.

- C. Consolidation of Large Nation States. The Unification of Italy. The founding of the German empire. The American Civil War. Colonialism and imperialism in Asia and Africa in the 19th and 20th centuries. China and the Western Powers. Modernisation of Japan and its emergence as a great power. The European Powers and the Ottoman Empire (1815-1914) The First World War-The Economic and social impact of the War-The Peace of Paris 1919.
- D. The Russian Revolution, 1917-economic and Social Reconstruction in Soviet-Union. Rise of Nationalist Movements in Indonesia, China and Indo-China. Rise and establishment of Communism in China. Awakening in the Arab world Struggle for freedom and reform in Egypt-Emergence of Modern Turkey under Kamalataturk. The rise of Arab nationalism. World Depression of 1929-32. The New Deal of Franklin D. Roosevelt. Totalitarianism in Europe-Fascism in Italy, Nazism in Germany. Rise of Militarism in Japan. Origins and impact of Second World War.

HOME SCIENCE
PAPER- I

- A. Meaning, importance and processes of Home Management.
- B. Resources-Human and Non-Human
 - (i) Time :
 - (a) Time as resource
 - (b) Time Plans
 - (c) Time demands during different stages of family life,
 - (ii) Energy :
 - (a) Energy as a resource
 - (b) Energy demands during different stages of family life.
 - (c) Fatigue-Physiological and Psychological
 - (iii) Money as a resource :
 - (a) Sources of income
 - (b) Types of income
 - (c) Methods of handling family income
 - (d) Budgeting-Types, preparation, Account keeping, savings and investments.
 - (iv) (a) Objectives and principles of work simplification.
- C. Consumer Economics :
 - (a) Consumer goods-classification, brands, advertisements.
 - (b) Consumer Protection-Quality control and Labelling.
- D. Home furnishing and Interior decoration :
 - (c) Objectives and principles of home furnishing
 - (d) Flower arrangement, principles and types
 - (e) Accessories.

II. CLOTHING & TEXTILES :

- A. (i) A study and classification of textile fibres.
 - (ii) Properties of –
 - (a) Cellulose fibres.
 - (b) Protein fibres
 - (c) Thermoplastic fibres
 - (d) Mineral fibres.
- B. Yarn :
 - (i) Yarn making, different types of yarns.
 - (ii) Fabric construction.
 - (a) Weaving, different kinds of weaves-Plain, Twill, Datin, Dateen, pile, jacquard.
 - (b) Court of cloth
 - (c) Knitting.
- C. Finishes :
 - (i) Objectives of Finishes
 - (ii) Kinds of Finishes
- D. Dyeing and Printing Textiles.
 - (i) Study of different indigenous and chemical dyes.
 - (ii) Printing-Block, Screen, discharge, Resist.
- E. Dry cleaning – Use of absorbents and solvents.
- F. Clothing :
 - (i) Importance of clothing.
 - (ii) Sociological and Psychological aspects of clothing
 - (iii) Clothing in relation to family budget.

HOME SCIENCE : PAPER - II

1. FOODS AND NUTRITION :

- A. Review of Essential nutrients, their food sources, requirements and deficiency diseases.
 - 1) Carbohydrates.
 - 2) Proteins.
 - 3) Fats.
 - 4) Vitamins.
 - 5) Minerals.
- B. Balanced diet :
 - 1) Definition
 - 2) Factors to be considered while planning a balanced diet.

- C. Malnutrition, and optimum Nutrition :
 - 1) Definition
 - 2) Protein-Calorie Malnutrition,
 - 3) Kwashiorkor
 - 4) Marasmus
 - 5) Obesity.
- D. Diet therapy :
 - 1) Principles of therapeutic diets.
 - 2) Types of therapeutic diets-Liquid, Semisolid, bland and low sodium diet.
 - 3) Diets in diseases-peptic ulcer, Diabetic mellitus Hypertension, Anaemia.
- E. Food preservation :
 - 1) Importance and principles of food preservation.
 - 2) Different methods of food preservation-drying, smoking dehydration, refrigeration, pasteurization, canning.

2. CHILD DEVELOPMENT :

- A. Meaning and principles of child development.
- B. Growth and Development :
 - 1) Introduction
 - 2) Factors affecting growth and development.
 - 3) Types of growth and development. :
 - (a) Physical
 - (b) Social
 - (c) Emotional
 - (d) Language.
 - (e) Mental.
- C. Stages of development and characteristics of each stages :
 - 1) Infancy
 - 2) Pre-School.
 - 3) Childhood
 - 4) Adolescence.
- D. Prenatal care and development :
 - a) Diagnosis, signs and symptoms of Pregnancy.
 - b) Physical and Psychological care of the mother.
 - c) Stages of prenatal growth care and development.
 - d) Post natal care of mother.
 - e) Care of new born baby.
- E. Breast feeding and bottle feeding :
 - 1) Advantages and dis-advantages of each.
 - 2) Weaning.
- F. Child Psychology :
 - Definition, Meaning and scope.

LAW
PAPER - I

I. CONSTITUTIONAL LAW OF INDIA :

1. Nature of the Indian constitution : The distinctive features and its federal character.
2. Foundational Rights : Directive Principles and their relationship with Fundamental rights : Fundamental Duties.
3. Right to Equality.
4. Right to Freedom of Speech and Expression.
5. Right to Life and Personal Liberty,
6. Religions, Cultural and Educational Rights.
7. Constitutional position of the President and relationship with Council of Ministers.
8. Governor and his powers.
9. Supreme Court and High courts, their power and jurisdiction.
10. Union Public Service Commission and State Public Commission : Their powers and functions.
11. Principles of Natural Justice.
12. Distribution of Legislative powers between the Union and the States.
13. Delegated Legislation : its constitutionality, judicial and legislative controls.
14. Administrative and financial Relations between the Union and the state.
15. Trade, Commerce and Intercourse in India.
16. Emergency provisions.
17. Constitutional safeguards to Civil Servants.
18. Parliamentary privileges and immunities
19. Amendment of the Constitution.

II. INTERNATIONAL LAW

1. Nature of International Law
2. Source : Treaty Custom. General Principles of Law recognized by civilized nations, subsidiary means for the determination of law, Resolution of International organs and regulations of specialized Agencies.
3. Relationship between International Law and Municipal Law.
4. State Recognition and State Succession.
5. Territory of States : modes of acquisition, boundaries, International Rivers.
6. Sea : Inland Waters, Territorial Sea, Contiguous Zone, Continental Shelf, Exclusive Economic Zone and ocean beyond national jurisdiction,
7. Air-space and aerial navigation.
8. Outer space : Exploration and use of Outer Space.
9. Individuals, nationality, statelessness; Human rights and procedures available for their enforcement.
10. Jurisdiction of state : basis of jurisdiction, immunity from jurisdiction.
11. Extradition and Asylum
12. Diplomatic Missions and Consular Posts.
13. Treaties : Formation, application and termination.
14. State responsibility
15. United nations : its principal organs, powers and functions.
16. Peaceful settlement of disputes.
17. Lawful resource to force, aggression, self-defence, intervention.
18. Legality of the use of nuclear weapons; ban on testing of nuclear weapons, Nuclear Non-Proliferation Treaty.

**LAW
PAPER - II**

**I. LAW OF CRIMES AND TORTS :
Law of Crimes**

1. Concepts of Crimes; actus means ream mens rea in statutory offences, punishments, mandatory sentences, preparation and attempt.
2. Indian Penal code :
 - a) Application of the Code
 - b) General exceptions.
 - c) Joint and constructive liability
 - d) Abetment.
 - e) Criminal conspiracy.
 - f) Offences against the State.
 - g) Offences against Public tranquility.
 - h) Offences by or relating to public servants.
 - i) Offences against human body
 - j) Offences against property.
 - k) Offences relating to marriage : Cruelty by husband or his relatives to wife.
 - l) Defamation.
3. Protection of Civil Rights Act, 1955
4. Dowry Prohibition Act, 1961.
5. Prevention of food Adulteration Act, 1954.

Law of Torts

1. Nature of tortuous liability.
2. Liability based upon fault and strict liability.
3. Statutory liability
4. Vicarious liability
5. Joint Tort-feasors.
6. Remedies.
7. Negligence
8. Occupier's liability and liability in respect of structures.
9. Detinue and conversion.
10. Defamation
11. Nuisance
12. Conspiracy.
13. False imprisonment and malicious prosecution.

II. LAW OF CONTRACTS AND MERCANTILE LAW

1. Formation of contract.
2. Factors vitiating consent.
3. Void, voidable, illegal and unenforceable agreements.
4. Performance of contracts.
5. Dissolution of contractual obligations frustration of contracts.
6. Quasi-Contracts.
7. Remedies for breach of contract.

8. Sale of goods and hire purchase.
9. Agency
10. Formation and dissolution of Partnership
11. Negotiable Instruments.
12. The Banker-Customer relationship
13. Government control over private Companies.
14. The Monopolies and Restrictive Trade Practices Act, 1969.
15. The consumer Protection Act, 1986.

MATHEMATICS

PAPER I

Any five questions may be attempted out of 12 questions to be set in the paper.

Linear Algebra.

Vector space, bases, dimension of a finitely generated space, Linear transformations, Rank and nullity of a linear transformation, Cayley Hamilton theorem, Eigen-values and Eigenvectors.

Matrix of a linear transformation. Row and Column reduction. Echelon form. Equivalence, Congruence and similarity. Reduction to canonical forms.

Orthogonal, symmetrical, skew-symmetrical, unitary, Hermitian and skew-Hermitian matrices-their eigen-values, orthogonal and unitary reduction of quadratic and Hermitian forms. Positive definite quadratic forms. Simultaneous reduction.

Calculus.

Real numbers, limits, continuity, differentiability. Mean-value theorem, indeterminate forms, maxima and Minima. Curve Tracing.

Asymptotes.

Functions of several variable, partial derivatives, maxima and minima, Jacobian. Definite and indefinite integrals, Double and triple integrals (techniques only). Application to Beta and Gamma Functions. Areas, Volumes, centre of gravity.

Analytic Geometry of two and three-dimensions.

First and second degree equations in two dimensions in cartesian and polar co-ordinates. Plane, sphere, paraboloid, Ellipsoid, hyperboloid of one and two sheets and their elementary properties. Curves in space, curvature and torsion, Frenet's formulae.

Differential Equations.

Order and Degree of differential equation; differential equation of first order and first degree. Variables separate. Homogeneous. Linear, and exact differential equations. Differential equations with constant co-efficients. The complementary function and the particular integral of $-e^{ax}$, $\cos ax$, $\sin ax$, $x \sin ax$, $e^{ax} \cos bx$, $e^{ax} \sin bx$

Vector, Tensor, Statics Dynamics and Hydrostatics.

- (i) Vector Analysis - Vector Algebra, Differentiation of vector function of a scalar variable, Gradient, divergence and curl in cartesian, cylindrical and spherical coordinates and their physical interpretation. Higher order derivatives. Vector identities and Vector equations, Gauss and Stokes Theorems.

- (ii) **Tensor Analysis** - Definition of a Tensor, Transformation of coordinates. Contravariant and covariant tensors. Addition and multiplication of tensors, contraction of tensors. Inner product, fundamental tensor, christoffel symbols, covariant differential curl and divergence in tensor notation.
- (iii) **Statics** - 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.
- (iv) **Dynamics** - Degree of freedom and constraints. Rectilinear motion. Simple harmonic motion in a plane, Projectiles. Constrained motion. Work and energy. Motion under impulsive forces. Kepler's laws. Orbits under central forces motion of varying mass. Motion under resistance.
- (v) **Hydrostatics** - Pressure of heavy fluids, Equilibrium of fluids under given system of forces. Centre of Pressure. Thrust of curved surfaces. Equilibrium of floating bodies. Stability of equilibrium and Pressure of gases, problems relating to atmosphere.

MATHEMATICS

PAPER - II

This paper will be in two sections. Each section will contain eight questions.

Candidates will have to answer any five questions.

Section A: Algebra, Real Analysis, Complex Analysis, Partial Differential equations.

Section B: Mechanic, Hydrodynamics, Numerical analysis, Statistics including probability operation Research.

Algebra:

Groups, subgroups normal subgroups, homomorphism of groups, quotient groups. Basic isomorphism theorems. Sylow theorems. Permutation Groups. Cauchy's theorem. Rings and Ideals. Principal Ideal domains, unique factorizations and Euclidean domains. Field Extensions. Finite fields.

Real Analysis

Metric spaces, their topology with special reference to \mathbb{R} sequence in a metric space, Cauchy sequence. Completeness. Completion, Continuous functions. Uniform continuity. Properties of continuous functions on compact sets. Riemann Stieltjes Integral, Improper integrals and their conditions of existence. Differentiation of functions of several variables. Implicit function theorem, maxima and minima, Absolute and conditional Convergence of series of real and Complex terms, Re-arrangement of series, Uniform convergence, infinite products, Continuity, differentiability and integrability for series, Multiple integrals.

Complex Analysis.

Analytic functions. Cauchy's theorem, Cauchy's integral formula, power series. Taylor's series, singularities, Cauchy's Residue theorem and Contour integration.

Partial Differential Equations.

Formation of partial differential equations, types of integrals of partial differential equations of first order, Charbits method, partial differential equation with constant, co-efficients.

Mechanics.

Generalised Coordinates, Constrains holonomic and non-holonomic systems. D'Alembert's principle and Lagranges' equations. Movement of Inertia, Motion of rigid bodies in two dimension.

Hydrodynamics.

Equation of continuity, momentum and energy. Inviscid Flow Theory – Two dimensional motion, Streaming motion, Sources and sinks.

Numerical Analysis.

Transcendental and Polynomial Equations, Methods of tabulation, bisection, regula falsi, secants and Newton-Raphson and order of its convergence.

Interpolation and Numerical differentiation:- Polynomial interpolation with equal or unequal step size. Spline interpolation Cubic Splines. Numerical differentiation formulae with error terms.

Numerical Integration :- Problems of approximate quadrature, quadrature formulae with equispaced arguments, gaussian quadrature convergence.

Ordinary differential Equations:- Euler's method, multistep predictor Corrector method–Adam's and Milne's method, convergence and stability, Runge-Kutta methods. Probability and statistics.

1. **Statistical methods** - Concept of statistical population and random sample. Collection and presentation of data. Measure of location and presentation of data/Moment and Shephard's corrections. Cumulants Measures of Skewness and kurtosis.
Curve fitting by least squares Regression, correlation and correlation ratio. Rank correlation. Partial correlation co-efficient and Multiple correlation co-efficient.
2. **Probability** - Discrete sample space, Events, their union and intersection etc. Probability Classical relative frequency and axiomatic approaches, Probability in continuum, probability space, Conditional probability and independence. Basic laws of Probability, probability of combination events, Bayes' theorem, Random variable Probability function, Probability density function. Distributions function. Mathematical expectation. Marginal and conditional expectation.
3. **Probability distributions** – Binomial, Poisson, Normal μ , σ . Beta, Cauchy. Multinomial, Hypergeometric, Negative Binomial, Chebychev's lemma (Weak) law of large numbers, Central limit theorem for independent and identical varieties. Standard errors, Sampling distribution of t, F and Chi-square and their uses in tests of significance. Large sample, tests for mean and proportion.

Operational Research

Mathematical Programming - Definition and some elementary properties of convex sets, simplex methods, degeneracy, quality and sensitivity analysis, rectangular games and their solutions, Transportation and assignment problems, Kuhn-Tucker condition for non-linear programming. Bellman's optimality principle and some elementary applications of dynamic programming.

Theory of Queues - Analysis of steady state and transient solutions for queueing system with Poisson arrivals and exponential service time.

Deterministic replacement models. Sequencing problems with two machines, n jobs, 3 machines, n jobs (Special case) and n machines 2 jobs.

MIZO ELECTIVE

PAPER - I

1. Mizo elective Paper I Part A – Poetry Carries 60 marks.
This will be a brief introduction to the critical study of Mizo poetry from Pre-British period to the present day.
2. The Second part of this paper will be part B - Drama and carries 40 marks. There are two dramas one of which is Mizo origin and the other one is translation. This part of the paper requires the students to learn characteristics of drama with special reference to the two dramas.

MIZO ELECTIVE

PAPER - II

The second paper namely, A-prose and B-Fiction will be critic Prose and Fiction of Mizo origin.

MIZO ELECTIVE

PAPER - I

PAPER - I	100 marks
A.-Poetry -	60 marks
B- Drama -	40 marks

POETRY

- (a) Kum 1900 hmalam hlate -
 - 1) Salulam Zai chang 5
 - 2) Chawngchen Zai chang 5
 - 3) Chai hla chang 5
 - 4) Laltheri Zai chang 5
 - 5) Saikuti Zai chang 5
 - 6) Hrangchhawni Zai chang 5
 - 7) Awithangpa zai chang 5
- (b) Kum 1900-1920 chhung hlate -
 - 1) Tlangthim chhak lam kei ka en ang - Zosaphluia (D.E,Jones)
 - 2) Thlalerka ka vahvai chhung hian - Liangkhaia
 - 3) Ka lungchia hi man pek kha hriain - Zosapthara (E.Rowlands)
- (c) Kum 1920-1940 chhung hlate -
 - 1) Pialral ka ngai - Chang 5
 - 2) Lei lal puan ropui - C.Z. Huala
 - 3) Tlang a dang lung a leng - Saihnuna
- (d) Kum 1940-1965 chhung hlate -
 - 1) Ramthar Zai - Chang 5
 - 2) Chunnu lungmawl ka di Parte - (Kaihlek hla)
 - 3) Hmangaihna - Vankhama
 - 4) Leng dun ila - Lalzuithanga
 - 5) Vanhnuaui khuavel sakhming chhiarin - Rokunga.

(e) Kum 1965 hnu lam te -

- | | |
|--------------------------|---------------|
| 1) Kan hun tawng zingah | - Suakliana |
| 2) Ka pianna Zawlkhawpui | - Rokunga |
| 3) Ramngaih hla | - F.Rokima |
| 4) Tho la, ding ta che | - V.Thangzama |

B. DRAMA/LEMCHAN

- | | |
|---------------------|------------------------|
| 1) Liandova te Unau | - Lalthangfala Sailo |
| 2) Doctor Faustus | - Christopher Marlowe. |

TEXT BOOK :

- | | |
|--|--------------------------|
| 1) Rimawi Ram (Compiled & Edited by Lalthangfala Sailo for (CTBEB) | |
| 2) Doctor Faustus | - Lettu - C. Laltlankima |
| 3) Liandova te Unau | - Lalthangfala Sailo. |

MIZO ELECTIVE PAPER II

- | | |
|-------------|-----------|
| PAPER - II | 100 marks |
| A - Prose | 60 marks |
| B - Fiction | 40 marks. |

A. PROSE/THU

- | | |
|------------------------------------|-----------------------|
| 1) Thlirtu | - Kaphleia |
| 2) Zofaten kawng kan bove | - Zikpuii Pa |
| 3) Harsatna | - J. Malsawma |
| 4) Rihdil leh Mizoram | - Siamkima Khawihring |
| 5) Huaisen | - Darchhawna |
| 6) Khuai lui ral | - Lalzuia Colney |
| 7) Mizo tlawmngaihna a sir leh lam | - Sangzuala Pa |

FICTION/THAWNTHU PHUAH

- | | |
|---------------------------|-----------------|
| 1) Sialton Official | - C. Thuamluaia |
| 2) Phira leh Ngurthanpari | - Lalzuithanga |
| 3) Pangpar bawm (Lehlin) | - Rokhuma, Rev. |

PHILOSOPHYPAPER - I*Metaphysics and Epistemology*

Candidates will be expected to be familiar with theories and types of epistemology and Metaphysics- Indian and Western- with special reference to the following :-

- (a) Western – Idealism, Realism, Absolutism, empiricism, Rationalism; Logical 'I' Positivism; Analysis; Phenomenology; Existentialism and Pragmatism.
- (b) Indian- Paramans and Paramanys; Theories of truth and error; Philosophy of language of meaning; Theories of reality with reference to main system (Orthodox and Heterodox) of Philosophy.

PHILOSOPHY
PAPER II

Socio- Political Philosophy and Philosophy and Religion.

1. Nature of Philosophy; its relation to life, thought and culture.
2. The following topics with special reference to the Indian context including Indian Constitution :-
Political Ideologies : Democracy, socialism. Fascism, Theocracy, Communism and Sarvodaya.
Methods of Political Action Constitutionalism, Revolution. Terrorism and Satyagrah.
3. Traditional, change and Modernity with reference to Indian Social Institution.
4. Philosophy of Religious language and meaning.
5. Nature and scope of Philosophy of Religion, Philosophy of Religion, with special reference to
Buddhism, Jainism, Hinduism, Islam, Christianity and Sikhism.
 - (a) Theology and Philosophy of Religion.
 - (b) foundation of religious belief Reason revelation Faith and Mysticism.
 - (c) God, Immortality of Soul, Liberation and Problem and Evil and Sin.
 - (d) Equality : Unity and Universality of Religions; Religious tolerance, Conversion Secularism.
2. Moksha- Paths leading to Moksha.

PHYSICS
PAPER - I

MECHANICS, THERMAL PHYSICS AND WAVES AND OSCILLATIONS

1. *Mechanics :*

Conservation laws : Collision impact parameter, Scattering cross-section, centre of mass and lab system with transformation of physical quantities. Rutherford Scattering. Motion of a rocket under constant force field. Rotating frames of reference, Coriolis force, Motion of rigid bodies. Angular momentum, Torque and Precession of a top, Gyroscope. Central forces motion under inverse square law, Kepler's laws, motion of Satellites including geostationary). Galilean Relativity, Special Theory of Relativity, Michelson-Morley Experiments, Lorentz Transformations addition theorem of velocities. Variation of mass with Velocity. Ass-energy equivalence. Fluid dynamics, streamlines, turbulence, Bernoulli's Equation with simple applications.

2. *Thermal Physics :*

Laws of thermodynamics, Entropy, Carnot's cycle. Isothermal and adiabatic Changes. Thermodynamics Potentials, Maxwell's relations, the Clausius-Clapeyron equation, reversible cell, Joule-Kelvin effect, Stefan-Boltzmann Law. Kinetic Theory of Gases. Maxwell's Distribution Law of Velocities, Equipartition of energy., Specific heats of gases mean Free path, Brownian Motion. Black Body radiation, specific heat of solids-Einstein & Debye theories, Wein's Law, Planck's Law, Solar constant. Thermal ionization and Stellar spectra. Production of Law, temperatures using adiabatic demagnetization and dilution refrigeration, concept of negative temperature.

3. *Waves and Oscillations :*

Oscillations; Simple harmonic motion, stationary and travelling waves, Damped harmonic motion, Forced oscillation & Resonance. Wave equation, Harmonic Solutions, Plane and spherical waves, superposition of waves. Phase and Group velocities, Beats; Huygen's principle, interference. Diffraction Fresnel & Fraunhofer. Diffraction by straight edge, Single and multiple slits. Resolving power of grating and Optical Instruments. Rayleigh Criterion. Polarization, Production and Detection of polarized light (linear, circular and elliptical). Laser sources. Helium-Neon, Ruby and semiconductor diode). Concepts of spatial and temporal coherence. Diffraction as a Fourier Transformation. Fresnel and Fraunhofer diffraction by rectangular and circular apertures, Holography; theory and applications.

PHYSICS

PAPER II

ELECTRICITY & MAGNETISM MODERN PHYSICS AND ELECTRONICS

1. *Electricity & Magnetism :*

Coulomb's Law, Electric fields, Gauss's law, Electric-potential. Poisson and Laplace equations for a homogeneous dielectric, uncharged conducting sphere in a uniform field. Point charge and infinite conducting Plane. Magnetic shell. Magnetic induction and field strength. Biot-Savart law and applications. Electromagnetic induction, Faradays and Lenz's laws, self and mutual inductances. Alternating currents. L.C.R. circuits, series and parallel resonance circuits, quality factor, Kirchoff's laws with applications. Maxwell's equations and electromagnetic waves. Transverse nature of electromagnetic waves. Poynting vector. Magnetic field in matter-dia, para, ferro antiferro and ferri magnetism (qualitative approached only).

2. *Modern Physics :*

Bohr's theory of hydrogen atom. Electron spin. Optical and X-ray Spectra, Stern Gerlach experiment and spatial quantization- Vector model of the atom, spectral terms, fine structure of spectral lines. J-J and L-S coupling, Seeman effect, Pauli's exclusion principle, spectral terms of two equivalent and non-equivalent electrons. Gross and fine structure of electronic band Spectra. Raman effect. Photoelectric effect. Compton effect. De Broglie waves, Wave-Particle duality and uncertainty principle. Schrodinger wave equation with application to (i) particle in a box, (ii) motion across step potential, One Dimensional harmonic oscillator, Eigen values and Eigen functions. Compton effect. De Broglie waves, Wave-Particle duality and uncertainty principle. Schrodinger wave equation with application to (i) particle in a box, (ii) motion across step potential, One Dimensional harmonic oscillator, Eigen values and Eigen functions. Uncertainty Principle Radioactivity. Alpha, beta and gamma radiations. Elementary theory of the alpha decay. Nuclear binding energy. Mass spectroscopy, Semi empirical mass formula. Nuclear fission and fusion. Reaction Physics Elementary particles and their classification. Strong and weak electromagnetic interactions. Particle accelerator; cyclotron, Linear accelerators, Elementary ideas of super-conductivity.

3. *Electronics :*

Band theory of solids-conductors, insulators and semiconductors, Intrinsic and ex-intrinsic semiconductors. P-N junctions, Thermistor Zenner diodes reverse and forward biased P-N junction, solar cell. Use of diodes and transistors for rectification, amplification oscillations, modulation and detection of r.f. waves. Transistor receivers, Television, Logic Gates.

POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

PAPER - I

SECTION A

POLITICAL THEORY:

1. Main features of ancient Indian Political thought; Manu and Kautilya; Ancient Greek thought, Plato, Aristotle; General characteristics of European Medieval political thought; St. Thomas Aquinas, Marsiglio of Padua; Machavelli; Hobbes, Locke, Montesquieu, Rousseau, Bentham, J.S. Mill, T.H. Green, Hegel, Marx, Lenin and Mao-tse-Tung.
3. Nature and scope of Political Science : Growth of Political Science as a discipline Traditional vs. Contemporary approaches: Behaviourism and post behavioural developments; Systems theory and other recent approaches to political analysis, Marxist approach to political analysis.
4. The emergence and nature of the modern State : Sovereignty; Monistic and Pluralistic analysis of sovereignty; Power, Authority and Legitimacy.
5. Political obligation : Resistance and Revolution; Rights, Liberty, Equality, Justice.
6. Theory of Democracy.
7. Liberalism, Evolutionary Socialism (Democratic and Fabian): Marxian Socialism; Fascism.

SECTION B

GOVERNMENT AND POLITICS WITH SPECIAL REFERENCE TO INDIA

1. Approaches to the study of Comparative Politics : Traditional, Structural- Functional approach.
2. Political Institution : The Legislature, Executive and Judiciary; Parties and Pressure Groups; Theories of Party system; Lenin, Michels and Duverger; Electoral system, Bureaucracy- Weber's view and modern critiques of Weber.
3. Political Process : Political Socialization, modernization and Communication; the nature of the non-western political process; A general study of the constitutional and political problems affecting Afro-Asian societies.
4. Indian Political System :
 - (a) The Roots : Colonialism and nationalism in India; A general study of modern Indian social and political thought; Raja Ram Mohan Roy, Dadabhai Nauroji, Gokhale, Tilak, Sri Aurobindo, Iqbal Jinnha, Gandhi, B.R. Ambedkar, M.N. Roy and Nehru.
 - (b) The Structure : Indian constitution, fundamental rights and Directive Principles, Union Government; Parliament, Cabinet, Supreme Court and Judicial Review, Indian Federalism, Centre State relations, State Government, Role of the Governor, Panchayati Raj
 - (c) The Functioning : Class and Caste in Indian Politics, politics of regionalism, linguism and communalism. Problems of secularization of the policy and national integration, Political elites, the changing composition; Political parties and political participation; Planning and Developmental Administration; Socio-economic changes and its impact on Indian democracy

POLITICAL SCIENCE AND INTERNATIONAL RELATIONS**PAPER - II****PART - I**

1. The nature and functioning of the sovereign nation state system.
2. Concepts of International Politics : Power, National interest; Balance of Power, "Power Vacuum".
3. Theories of International Politics : The Realist theory; Systems theory; Decision making.
4. Determinants of foreign policy : National Interest, Ideology, elements of National Power (including nature of domestic socio-political institution).
5. Foreign Policy Choices : Imperialism; balance of Power : Allegiances; Isolationism; Nationalistic Universalism (Pax Britannica, Pax Americana, Pax-Sovietica) : The "Middle Kingdom" Complex of China; Non-alignment.
6. The Cold War : Origin, evaluation and its impact on international relations : Defence and its impact; a new Cold War ?
7. Non-alignment : Meaning, Bases (National and international) the non-aligned Movement and its role in international relations.
8. De-colonization and expansion of the international community : Neo-colonialism and racialism their impact on international relations : Asian-African resurgence.
9. The present international economic order Aid, trade and economic development The struggle for the New International Economic Order; Sovereignty over natural resources; the crisis in energy sources.
10. The Role and International law in International relations : The international court of justice.
11. Origin and Development of International Organizations : The United Nations and Specialized Agencies; their roles in international relations.
12. Regional Organisation : OAS, OAU, the Arab League, the ASEAN, the EEC, their role in international relations.
13. Arms race disarmament and arms control : Conventional and nuclear arms, the Arms Trade; its impact on Third world role in international relations.
14. Diplomatic theory and practice.
15. External intervention : ideological, political and economic, "Culture imperialism" Covert intervention by the major powers.

PART - II

1. The uses and mis-uses of nuclear energy; the impact of nuclear weapons in international relations, the Partial Test-ban Treaty; the Nuclear Non-Proliferations.
2. The problems and prospects of the Indian Ocean being made a peace zone.
4. The conflict situation in West Asia.
5. The (Post War) foreign policies of the major powers : United States, Soviet Union, China.
6. The Third World in international relations : the North-south "Dialogue" in the United Nations and Outside.
7. The India's foreign policies and relations; India and the Super Powers: India and its neighbour; India and south-east-Asia; India and African problems; India's economic diplomacy, India and the question of nuclear weapons.

PSYCHOLOGY
PAPER - I
FOUNDATION OF PSYCHOLOGY

1. *The scope of Psychology :*
Place of Psychology in the family of social and behavioural sciences.
2. *Methods of psychology :*
Methodological problems of psychology. General design of psychological research. Types of psychological research. The characteristic of psychological measurement.
3. *The nature, origin and development of human behaviour*
Heredity and environment. Cultural factors and behaviour the process of socialization. Concept of National Character.
4. *Cognitive Processes.*
Perception, Theories of perception. Perceptual organization. Person perception, perceptual defence. Transactional approach to perception. Perception and personality, Figural alter-effect, Perception styles. Perceptual abnormalities. Vigilance.
5. *Learning :*
Cognitive, Operant and Classical conditioning approaches. Learning phenomena Extinction. Discrimination and generalization. Discrimination learning. Probability learning, Programmed learning.
6. *Remembering :*
Theories of remembering. Short-term memory, Long term memory. Measurement of memory. Forgetting. Reminiscence.
7. *Thinking :*
Problem solving concept formation. Strategies of concept formation. processing. Creative thinking. Convergent and Divergent thinking. Development of thinking of children theories.
8. *Intelligence :*
Nature of intelligence. Theories of intelligence. Measurement of intelligence. Measurement of creativity. Aptitude Measurement of aptitudes. The concept of social intelligence.
9. *Motivation :*
Characteristic of motivated behaviour. Approaches to motivation. Psycho- analytic theory. Drive Theory, Need Hierarchy theory. Vector valence approach. Concept of level of spiration. Measurement of Motivation. The apathetic and the alienated individual. Incentives.
10. *Personality :*
The concept of personality. Trait and type approaches. Factorial and dimensional approaches. Theories of personality : Freud, Allport, Murray, Cattell. Social learning theories and Field Theory. The Indian approach to personality, the concept of Gunas. Measurement of personality; Questionnaires; Rating Scales; Psychometric Tests; Protective Tests; Observation method.
11. *Language and Communication :*
Psychological basis of language. Theories of language Development. Skinner and Chomsky. Non-verbal communication; Body language. Effective communication. Source and receiver characteristics. Persuasive Communications.
12. *Attitudes and Values :*
Structure of attitudes. Formation of Attitudes. Theories of attitudes. Attitudes measurement. Types of attitude scale. Theories of attitude change Values. Types of values. Motivational properties of values. Measurement of values.

13. *Recent trends :*
Psychology and the computer. Cybernetic model of behaviour. Stimulation studies in psychology. Study of consciousness. Altered states of consciousness. Sleep, dream, meditation and hypnosis : drug induced changes. Sensory human problems in aviation and space flight.
14. *Models of man:*
The mechanical Man. The organic Man. The Organisational man. The Humanistic Man. Implications of the different models for behaviour changes. An integrated model.

PSYCHOLOGY
PAPER - II
PSYCHOLOGY : ISSUES AND APPLICATIONS.

1. *Individual differences.*
Measurement of individual differences. Type of psychological tests. Construction of psychological tests. Characteristics of a good psychological test. Limitations of psychological tests.
2. *Psychological Disorders.*
Classification of Disorders and psychological systems. Neurotic, Psychotic and psychophysiological disorders, Psychopathic personality. Theories of psychological disorders. The problems of anxiety, depression and stress.
3. *Therapeutic Approaches.*
Psychodynamic approach. Behaviour therapy. Client-centered therapy. Cognitive therapy. Group therapy.
4. *Application of psychology to Organisational industrial problems.*
Personnel selection. Training. Work Motivation. Theories of work motivation. Job designing. Leadership training. Participatory management
5. *Small Groups.*
The concept of small group. Properties of groups, Group at work, theories of group behaviour, Measurement of group behaviour. Interaction process analysis. Inter-personal relations.
6. *Social change.*
Characteristics of social change. Psychological basis of change. Steps in the change process. Resistance to change. Factors contributing to resistance. Planning for change. The concept of change proneness.
7. *Psychology and the Learning process.*
The Learner. School as an agent of socialization. Problems relating to adolescents learning situations. Gifted and retarded children and problems related to their training
8. *Disadvantaged Groups.*
Types : Social, cultural and economic, psychological consequences of disadvantage. Concept of deprivation. Educating the disadvantaged groups. Problems of motivating the disadvantaged groups.
9. *Psychology and the problems of social integration.*
The problem of ethnic prejudice. Nature and prejudice. Manifestation of prejudice. Development of prejudice. Measurement of prejudice. Amelioration of prejudice. Prejudice and personality. Steps to achieve social integration.
10. *Psychology and Economic Development.*
The nature of achievement motivation. Motivating people for achievement Promotion of entrepreneurship. The entrepreneurship Syndrome. Technological change and its impact on human behaviour.
11. *Management of Information and Communication, psychological factors in Information Management.*
Information overload. Psychological basis of effective Communication. Mass Media and their role in Social change. Impact of Television. Psychological basis of effective advertising.

12. Problems of Contemporary Society. Stress, Management Stress. Alcoholism and drug Addiction. The Socially Deviant. Juvenile Delinquency. Crime Rehabilitation of the deviant. The problem of the aged.

PUBLIC ADMINISTRATION

PAPER - I

ADMINISTRATIVE THEORY

- I. Basic Premises : Meaning, scope and Significance of Public Administration; Private and Public Administration; its role in Developed and Developing Societies; Ecology of Administration, Social, Economic, Cultural, Political and Legal; Evolution of Public Administration as an art and a Science; New Public Administration.
- II. Theories of Organisation : Scientific management (Taylor and his Associates); The Bureaucratic theory of Organisation (Weber); Classical theory of Organisations (Henri Fayol. Luther Gulic and others); The Human Relations Theory of Organisations (Elton Mayo and his Colleagues); Behaviour Approach, Systems Approach; Organisational Effectiveness.
- III. Principles of Organization—Hierarchy, Unity of Command : Authority and Responsibility. Co-ordination, span of Control, supervision, Centralization and Decentralization., Delegation.
- IV. Administrative Behaviour : Decision making with special Reference to the contribution of Herbert Simon, theories of Leadership; Communication; morale; Motivation (Maslow and Herzberg).
- V. Structure of Organisation : Chief Executive, type of Chief Executives and their functions; Line, Staff and Auxiliary agencies; Department; Corporations, Companies, Boards and Commissions. Headquarters and Field relationship.
- VI. Personnel Administration : Bureaucracy and Civil Services; position Classification; Recruitment; Training, Career Development; Performance Appraisal; Promotion, Pay and Service Conditions; Retirement Benefits; Discipline, Employer-Employee Relations, Integrity in Administration, Generalists and Specialists, Neutrality and Anonymity.
- VII. Financial Administration : Concept of Budget, Preparation and Execution of the Budget; Performance Budget; Legislative Control, Accounts and Audit.
- VIII. Accountability and Control : The concept of Accountability and Control; Legislative, Executive and Judicial Control over Administration, Citizen and Administration.
- IX. Administrative Reforms : O & M work Study; Work Measurement, Administrative Reforms; Process and Obstacles.
- X. Administrative Law : Importance of Administrative Law, Delegated Legislation; Meaning, Types, Advantages, Limitations, Safeguards. Administrative Tribunals.
- XI. Comparative and Development Administration : Meaning, Nature and Scope Comparative Public Administration, Contribution of Fred Riggs with particular reference to the Prismatic-Sale model. The concept, Scope and Significance of Development Administration . Political Economic and Social Culture context of Development Administration. The concept of Administrative Development.
- XII. Public Policy : relevance of Policy Making in Public Administration. The process of Policy formulation and Implementation.

PUBLIC ADMINISTRATION
PAPER - II

INDIAN ADMINISTRATION

- I. Evolution of Indian Administration-Kautilya; Mughal period; British period.
- II. Environmental Setting contribution, Parliamentary, Democracy, Federalism, Planning, socialism.
- III. Political Executive at the Union Level-President, Prime Minister, Council of Ministers, Cabinet Committees.
- IV. Structure of Central Administration- Secretariat, Cabinet Secretariat, Ministries and Departments; Boards and Commission, Field Organisations.
- V. Centre- State Relations- Legislative, Administrative, Planning and Financial.
- VI. Public Services-All India Services, Central Services, State Services, Local Civil Services, Union and State Public Service Commissions, Training of Civil Services.
- VII. Machinery for Planning-Plan formulation at the National Level; National Development Council; Planning Commission; Planning Machinery at the State and district Levels.
- VIII. Public Undertakings-Forms, Management, Control and problems.
- IX. Administration of Law and Order role of Central and State agencies in maintenance of Law and Order.
- X. State Administration- Governor, Chief Ministers, Council of Ministers, Secretariat, Chief Secretary, Directorates.
- XI. District and Local Administration- role and Importance; District Collector: Land Revenue, Law and Order and Development function. District Rural Development Agency, Special Development Programmes.
- XII. Local Administration- Panchayati Raj; Urban Local Government. Features, forms, Problems, Autonomy of Local Bodies.
- XIII. Administration for Welfare – Administration for the welfare of Weaker Sections with Particular References to Scheduled Castes, Scheduled Tribes and Programmes for the Welfare of Women.
- XIV. Issue of Areas in Indian Administration – Relationship between Political and Permanent Executives. Generalists and Specialists in Administration. Integrity in Administration Peoples participation in administration Redressal of Citizens Grievances Lok Pal and Lok Ayuktas, Administrative Reforms in India.

SOCIOLOGY
PAPER I

GENERAL SOCIOLOGY

Scientific study of social phenomena : The emergence of Sociology and its relationships with other disciplines; science and social behaviour, the problem of objectivity, the scientific method and design of sociological research; techniques of data collection and measurement including participant and non-participant observation, interview schedule and questionnaires and measurement of attitudes.

Pioneering contributions of sociology : The seminal ideas of Durkheim, Weber, Red-cliffe-Brown, Malinowski, Persons, Merton and Marx historical materialism alienation, class and class struggle Durkheim-division of labour, social fact, religion and society, Weber social action types of authority bureaucracy, rationality. Protestant ethic and the spirit of capitalism ideal types.

The individual society : Individual behaviour; social interaction, society and social group; social system, status and role; culture, personality and socialization, conformity deviance and social control; role conflict;

Social Stratification and mobility : Inequality and Stratification, different conceptions of class; theories of Stratification; caste and class; class and society; types of mobility, intergenerational mobility; open and closed models of mobility.

Family, Marriage and kinship : Structure and functions of family; Structural principles of kinship; family descent and kinship; change in society, change in age and sex roles and change in marriage and family; marriage and divorce.

Formal organizations : Elements of formal and informal structures bureaucracy; Modes of participation-democratic and authoritarian forms, voluntary associations.

Economic System : Property Concepts, Social dimensions of division of Labour and types of exchange, social aspects of pre-industrial and industrial economic system; Industrialization and changes in the political, educational, religious, familiar and stratificational spheres, social determinants and consequences of economic development.

Political system : Social origins and orientation of students and teachers, equality of educational opportunity, education as a medium of cultural reproduction, indoctrination, social stratification and mobility; education and modernisation.

Educational system : Social origins and orientation of students and teachers, equality of educational opportunity, education as a medium of cultural reproduction, indoctrination, social stratification and mobility; education and modernisation.

Social change and development : Social structure and social change, continuity and change as fact and as value; process of change; theories of change; social disorganization and social movements; types of social movements; direct and social change, social policy and social development.

SOCIOLOGY

PAPER- I

SOCIETY OF INDIA

Historical moorings of the Indian Society : Traditional Hindu social organisation; socio-cultural dynamics through the ages; especially the impact of Buddhism, Islam and the modern West, factors in continuity and change.

Social Stratification : Caste System and its transformation aspects of ritual, economic and caste status, cultural and structural views about caste, mobility in caste, issue of equality and social justice, and caste among the Hindus and the non-Hindus; casteism; the Backward Classes and the Scheduled Caste, untouchability and its eradication; agrarian and industrial class structure. Family marriage and kinship; Regional variation in Kinship systems and its socio-cultural correlates changing aspects of Kinship; the joint family-its structural and functional aspects and its changing formal and disorganisation; marriage among different ethnic groups and economic categories, its changing trend and its future; impact of legislation and socio-economic change upon family and marriage, inter-generations gap and youth unrest; changing status of women.

Economic system : The jajmani system and its bearing on the traditional society; market economy and its social consequences occupational diversification and social structure profession trade unions; social determinants and consequences of economic development, economic inequalities, exploitation corruption.

Political systems : The functioning of the democratic political system in a traditional society; political parties and their social composition; social structural origins of political elites and their social orientations, decentralization of power and political participation.

Educational system : Education and society in the traditional and the modern context, educational inequality and change; education and social and mobility, educational problems of Women, the Backward Classes and the Scheduled Castes.

Religion : Demographic dimensions, geographical distribution and neighbourhood living patterns of major religious categories; inter-religious interaction and its manifestation in the problems of conversion, minority status and communalism, secularism.

Tribal society and their integrations : Distinctive features of tribal communities, tribes and caste; acculturation and integration.

Rural Social system and community development : Socio-cultural dimensions of the village community; traditional power structure, democratization and leadership; poverty, indebtedness and bonded labour; social consequences of land reforms, Community Development Programme and other planned development projects and pf Green Revolution, New strategies of rural development.

Urban social organization : Continuity and change in the traditional cases of social organization, namely, kinships, caste and religion in the urban context, stratification and mobility in urban communities, ethnic diversity and community integration, urban neighbourhoods, rural-urban differences in demographic and socio-cultural characteristics and their social consequences.

Population dynamics : Socio-cultural aspects of sex and age structure, marital status, fertility and morality, the problem of population explosion, social, psychological, cultural and economic factors in the adoption of family planning practices

Social change and modernization : Problems of Role conflict-Youth unrest-inter-generational gap changing Status of Women, Major Sources of social changes and Resistance to change, impact of West, reform movement, social movements, industrialization and urbanization pressure groups factors of planned change- Five Year Plans legislative and executive measures, process of change – sanskritization, westernization and modernization, means of modernization-mass media and education, problem of change and modernization-structural contradictions and breakdowns.

Current Social Evils : Corruption and Nepotism-Smuggling- Black Money.

ZOOLOGY

PAPER - I

Non Chordata and chordate, Ecology. Ethology, Biostatistics and Economic Zoology.

SECTION - 'A'

Non-Chordata and Chordata.

1. A general survey, classification and relationship of the various phyla.
2. *Protozoa* : Study of the structure, bio-nomica and life history of Paramecium, monocyotics, malarial parasite, Trypanosoma and Leishmania- Locomotion, nutrition and reproduction in Protozoa.
3. *Porifera* : Canal system, Skeleton and reproduction.
4. *Coelenterata* : Structure and life history of Claria and Aurelia, polymorphism in Hydrozoa, coral formation, mutagenesis, phylogenetic relationship of Cnidaria and Acnidaria.
5. *Helminths* : Structure and life history of Planaria, Fasciola, Taenia and Ascaris, Parasitic adaptation, Helminths in relation to man..
6. *Annelida* : Neries, earthworm and leech; coelom and metamerism, modes of life in polychaetes.
7. *Arthropoda* : Palemon, Scorpion, cockroach, larval forms and parasitism in Crustacea, Mouth part vision and respiration in arthropods, social life and metamorphosis in insects, importance of Peripatus.
8. *Mollusca* : Unio Pila, oyster culture and pearl formation, cephalopods.
9. *Echinodermata* : General organization, larval forms and affinities of Echinodermata.
10. General organization and characters, outline classification and inter-relationship of photochordata, Pisces, Amphibia, Reptilia, Aves and mammalian..
11. Neoteny and retrogressive metamorphosis.
12. A general study of comparative account of the various systems of vertebrates.
13. Locomotion, migration and respiration in fishes, structure and affinities of dipnoi.
14. Origin of Amphibia; distribution, anatomical peculiarities and affinities of Urodela and Apoda.
15. Origin of Reptiles; adaptive radiation in reptiles fossil reptiles; poisonous and non-poisonous snakes of India; poison apparatus of snake.
16. Origin of Birds; flightless birds; aerial adaptation and migration of birds.
17. Origin of mammals; homologies of ear ossicles in mammals; dentition and skin derivatives in mammals; distribution; structural peculiarities and phylogenetic relations of Prototheria and Metatheria.

SECTION 'B'

Ecology, Ethology, Biostatistics and Economic Zoology.

Ecology :

1. Environment : Abiotic factors and their role, Biotic factors inter and Inter-specific relations.
2. Animal : Organisation at population and community levels, ecological successions.
3. Ecosystem : Concept, components, Fundamental operation, energy flow, bio-geochemical, cycles, food chain and tropic levels.
4. Adaptation in fresh water, marine and terrestrial habitats.
5. Pollution in air, water and land.
6. Wild life in India its conservation.

Ethology :

7. General survey of various types of animal behaviour.
8. Role of hormones and pheromones in behaviour.
9. Chronobiology : Biological clock, seasonal rhythms, tidal rhythms.
10. Neuro-endocrine control of behaviour.
11. Methods of studying animals behaviour.

Biostatistics :

12. Methods of sampling, frequency distribution and measures of central tendency, standard deviation, standard error and standard deviance, correlation and regression and Chi square and to t-test.

Economic Zoology :

13. Parasitism, commensalisms & host parasite relationship.
14. Parasitic protozoans, helminthes and insects of man and domestic animals.
15. Inspect pests of crops and stores products.
16. Beneficial insects.
17. Pisciculture and induced breeding.

Z O O L O G Y**PAPER - II**

Cell Biology, Genetics, Evolution and Systematic, Bio-Chemistry, Physiology and Embryology.
Section 'A'

Cell Biology Genetics, Evolution and Systematic.

1. *Cell Biology* : Structure and function of cell and cytoplasmic constituents; structure of nucleus, plasma membranes, mitochondria, golgibodies, endo-plastic reticulum and ribosomes, cell division; mitotic spindle and chromosome movements and meiosis.

Gene structure and function : Watson-Crick model of DNA, replication of DNA Genetic model protein synthesis cell differentiation, sex chromosomes and sex determination.

2. Genetics : Mendelian laws of inheritance re-combination linkage and linkage maps, multiple, alleles, mutation (natural and induced), mutation and evolution meiosis, chromosome number and form, structural rearrangements; polyploidy-cytoplasmic inheritance, regulation of gene expression in prokaryotes and eukaryotes; biochemical genetic, elements of human genetics; normal and abnormal karyotypes; genes and diseases, Eugenics.

3. Evolution and systematics : Origin of life, history of evolutionary thought, Lamarck and his works. Darwin and his works, source and nature of organic variation. Natural selection Hardy-Weinberg law, Cryptic and warning coloration mimicry; isolating mechanisms and their role. Insular fauna, concept of species and sub-species, principle of classifications, zoological nomenclature and international code. Fossils, outline of geological eras phylogeny of horse, elephant, camel, origin and evolution of man, principle and theories of continental distribution of animal zoo-geographical realms of the world.

Section – 'B'

Biochemistry; Physiology and Embryology.

1. Biochemistry : Structure of carbohydrates, lipids, amino acids, proteins and nucleic acids, glycolysis and Krebs cycles, oxidation and reductions, oxidative phosphorylation, energy conservation and releases, ATP, Cycling AMP, saturated and unsaturated fatty acids, cholesterol, steroid hormones. Types of enzymes, mechanism of enzymes, mechanism of enzymes action immunoglobulin and immunity, vitamins and coenzyme Hormones, their classification, biosynthesis and functions.
2. Physiology with special reference to mammals, composition of blood, blood groups in man, coagulation, oxygen and carbon dioxide transport, hemoglobin, breathing and its regulations nephron and urine formation, acid-base balance and homeostasis, temperature regulation in man, mechanism of conduction along axon and across synapses, neurotransmitters, vision, hearing and other receptors; types of muscles, ultra structures and mechanism of contraction of skeletal muscle; role of salivary gland, liver, pancreas and intestinal glands and digestion, absorption of digested food, nutrition and balanced diet of man, mechanism of action steroids and peptide hormones, role of hypothalamus, pituitary thyroid, parathyroid, pancreas adrenal testis, ovary and lines organs and their inter-relationship, physiology of reproduction in humans, hormonal control of development in man and insects, pheromones in insects and mammals.
3. Embryology : Gametogenesis, Fertilization, types of eggs, cleavage, development upto gastrulation in branchiostoma, frog and chick; Fate maps of frogs and chicks; Metamorphosis in frog. Formation and Fate of extra embryonic membranes in chick; formation of amnion allantois and types of placenta in mammals, function of placenta in mammals; Organisms, Regeneration, genetic control of development. Organogenesis of central nervous system sense organs heart and kidney of vertebrate embryos. Ageing and its implication in relation to man.

ANTHROPOLOGY

PAPER I

- 1.1 Meaning and scope Anthropology
- 1.2 Relationship with other disciplines. History, Economics, Sociology, Psychology, Political Science, Life Science, Medical Science.
- 1.3 Main branches of Anthropology, their scope and relevance
 - a) Socio-cultural Anthropology
 - b) Physical and Biological Anthropology
 - c) Archaeological Anthropology.
- 1.4 Human Evolution and emergence of Man.

Organic Evolution – Theories of evolution in historical perspective, pre-Darwinian. Darwinian and Post-Darwinian period. Modern synthetic theory of evolution; brief outline of terms and concepts of evolutionary biology (Doll's rule, Cope's rule, Gause's rule, parallelism, convergence, adaptive radiation, mosaic evolution), Principles of systematics and taxonomy, major primate taxa, tertiary and quaternary fossil primates, systematics of Hominoidea and Hominidae, Origin and evolution of man- '*Homo erectus* and *Homo sapiens*'

1.5 Phylogenetic status, characteristics and distribution of the following

- a) Prepleistocene fossil primates - *Oreopithecus*.
- b) South and East African hominids-*Plesianthropus/Australopithecus Africanus*, *Paranthropus*, *Australopithecus*.
- c) *Paranthropus*- *Homo Erectus*- *Homo Erectus Javanicus*, *Homo Erectus Pekinesis*.
- d) *Homo Heidelbergensis*.
- e) *Neanderthalman-La-Chapelle-aux-saints* (Classical type), *Mount Carmelites types* (Progressive type).
- f) *Rhodesian man*
- g) *Homo sapiens*- *Cromagnon*, *Grimaldi*, *Chancelade*.

Recent advances in understanding the evolution, distribution and multidisciplinary approach to understand a fossil type in relation to others.

1.6 Evolutionary trend and classification of the order Primates, Relationship with other mammals, molecular evolution of Primates. Comparative anatomy of man and apes, primate locomotion, terrestrial and arboreal adaptation, skeletal changes due to erect posture and its implications.

1.7 Cultural Evolution-broad outlines of pre-historic cultures :

- a) Palaeolithic
- b) Mesolithic
- c) Neolithic
- d) Chalcolithic
- e) Copper-Bronze age
- f) Iron age

2.1 Family – Definition and typology of family, household and domestic groups. Basic structure and functions; stability and changes in family. Typological and processual approaches to the study of family. Impact of urbanization, industrialization, education and feminist movements. Universality of family a critique.

2.2 Concept of kinship : Definition of kin, incest prohibition exogamy and endogamy. Principles of descent types and functions. Political and rural aspects of kinship. Unilineal, bilateral and double descent. Descent, filiation and complementary filiation. Kinship terminology, typology and approaches to the study of terminology Alliance and descent.

2.3 Marriage- Definition, types and variation of marriage systems. Debates on the universal definition of marriage. Regulation of marriage preferential, prescriptive, proscriptive and open systems. Types and form of marriage Dowry, bride-price, pestation and marriage stability.

3.1 Study of culture, patterns and processes, concept of culture, patterns of culture, relationships between culture and civilization and society.

3.2 Concept of Social Change and Cultural Change.

3.3 Social structure and social organization, Role-analysis and social network, institutions, groups community. Social stratification, principles and form, status, class and power, gender. Nature and types of mobility.

3.4 Concept of Society.

3.5 Approaches to the study of culture and society-classical evolutionism, neo-evolutionism, culture ecology, historical particularism and diffusionism, structural-functionalism, culture and personality, transactionalism, symbolism, cognitive approach and new ethnography, post structuralism and post-modernism.

- 4.1 Definitions and functions of religion. Anthropological approaches to the study of religion-evolutionary, psychological and functional. Magic, witchcraft and sorcery, definitions and functions and functionaries, priest, shaman, medicine man and sorcerers. Symbolism in religion and rituals. Ethnomedicine. Myths and rituals definitions and approaches to their study-structural, -functional and processual relation with economic and political structures.
- 5.1 Meaning, scope and relevance, principles governing production, distribution and consumption in communities subsisting on hunting-gathering, fishing, pastoralism, horticulture and other economic pursuits. Formalist and sub substantivist debate - Dalton, Karl-polyanny and Marx approach and New Economic Anthropology. Exchange gifts, barter, trade, ceremonial exchange and marked economy.
- 5.2 Theoretical foundations. Types of political organisations- band, tribe, chiefdom, state, concept of power, authority and legitimacy. Social control, law and justice in tribal and peasant societies.
- 6.1 Concepts of developmental Anthropological perspective. Models of development. Critiques of classical developmental theories. Concepts of planning and planned development. Concepts of participator development. Culture ecology and sustainable development. Displacement and rehabilitation.
- 7.1 Concept of research in anthropology, subjectivity and reflexivity in terms of gender class, ideology and ethics. Distinction between methodology, methods and techniques. Nature and explanation in anthropological research. Positivist and non-positivist approaches. Comparative methods; nature, purpose and methods of comparison in social and cultural anthropology. Basic techniques of data collection. Interview, participant and other forms of observation, schedules, questionnaire, case-study methods, extended cases study methods, life histories and secondary sources, oral history, genealogical method, participatory, learning and assessment (PLA). Participatory Rapid Assessment (PRA). Analysis, interpretation and presentation of data.
- 8.1 Concept, scope and major branches of human genetics. Its relationship with other branches of science and medicine.
- 8.2 Method for study of genetic principles in man-family study (pedigree analysis, twin study, foster child, co-twin method, cytogenetic method, chromosomal and karyotype analysis), biochemical methods, immunological methods, D.N.A. technology and recombinant technologies.
- 8.3 Twin study method-zygosity, heritability estimates, present status of the twin study method and its applications.
- 8.4 Mendelian genetics in man-family study, single factor, multifactor, lethal, sub-lethal and polygenic inheritance in man.
- 8.5 Concept of genetic polymorphism and selection, Mendelian population, Hardy-Weinberg law. Causes and changes which bring down frequency-mutation, isolation, migration, selection, in-breeding and genetic drift. Consanguineous and non-consanguineous mating, genetic load, genetic effect of consanguineous and cousin marriages (statistical and probability methods for study of human genetics).
- 8.6 Chromosomes and chromosomal-aberrations in man, methodology.
 - a) Numerical and structural aberrations (disorders).
 - b) Sex chromosomal aberrations Klinefelter (XXY), Turner (XO), Super female (XXX), intersex, and other syndromic disorders.
 - c) Autosomal aberrations-Down syndrome, Patau, Edward and Cri-du-chat syndromes.
 - d) Genetic imprints in human disease, genetic screening, genetic counselling, human DNA profiling, gene mapping and genome study.
- 8.7 Concept of race in historical and biological perspective. Race and racism, biological basis of morphological variation of non-metric and metric characters. Racial criteria, racial traits in relation to heredity and environment; biological basis of racial classification, racial differentiation and race-crossing in man.

- 8.8 Ethnic groups of mankind : characteristics and distribution in world, racial classification of human groups. Principal living peoples of world. Their distribution and characteristics.
- 8.9 Age, sex and population variation in genetic marker-ABO, Rh blood groups, HLA, Hp, transferrin, Gm, blood enzymes. Physiological characteristics-Hb level, body fat, pulse rate, respiratory functions and sensory perceptions in different cultural and socio-economic groups. Impact of smoking air pollutions, alcoholism, drugs and occupational hazards on health.
- 9.1 Concepts and Methods of Ecological Anthropology. Adaptation-social and cultural Deterministic theories-a critique. Resources-biological, non-biological and sustainable development. Biological adaptation-climatic environmental, nutritional and genetic.
- 10.1 Relevance in understanding of contemporary society. Dynamics of ethnicity at rural, tribal, urban and international levels. Ethnic conflicts and political developments. Concept of ethnic boundaries. Ethnicity and concept of nation state.
- 11.1 Concept of human growth and development-stages of growth-prenatal, natal, infant, childhood, adolescence, maturity, senescence.
Factors affecting growth and development genetic, environmental, biochemical, nutritional, cultural and socio-economic.
Ageing and senescence. Theories and observations biological and chronological longevity. Human physique and somato-types. Methodologies for growth studies.
- 12.1 Reproductive biology, demography and population study. Reproductive physiology of male and female. Biological aspects of human fertility. Relevance of menarche, menopause and other bioevents to fertility. Fertility patterns and differentials.,
- 12.2 Demographic theories-biological, social and cultural.
- 12.3 Demographic methods-census, registration system, sample methods, duct reporting system.
- 12.4 Population structures and population dynamics.
- 12.5 Demographic rates and ratios, life table structure and utility.
- 12.6 Biological and socio-ecological factors influencing fecundity, fertility, natality and mortality.
- 12.7 Methods of studying population growth.
- 12.8 Biological consequences of population control and family welfare.
- 13.1 Anthropology of sports.
- 13.2 Nutritional Anthropology.
- 13.3 Anthropology in designing of defence and other equipments.
- 13.4 Forensic Anthropology.
- 13.5 Methods and principles of personal identification and reconstruction.
- 13.6 Applied human genetics-Paternity diagnosis genetic counselling and eugenics.
- 13.7 DNA technology-prevention and cure of diseases.
- 13.8 Anthro-po-genetics in medicine.
- 13.9 Serogenetics and cytogenetics in reproductive biology.
- 13.10 Application of statistical principles in human genetics and Physical Anthropology.

ANTHROPOLOGY

PAPER II

1. Evolution of the Indian Culture and Civilization. Pre-historic (Palaeolithic, Mesolithic and Neolithic), Protohistoric (Indus Civilization). Vedic and Post-Vedic beginnings. Contributions of the tribal cultures.
2. Demographic profile of India. Ethnic and linguistic elements in the Indian population and their distribution. Indian population, factors influencing its structure and growth.

3. The basic structure and nature of traditional Indian social system - a critique. Varnasharam, Purushartha, Karma, Rina and Rebirth. Theories on the origin of caste system, Jajmani system. Structural basis of inequality in traditional Indian society. Impact of Buddhism, Jainism, Islam and Christianity on Indian society.
4. Emergence, growth and development of anthropology in India- contributions of the 19th Century and early 20th Century scholar-administrators. Contributions of the Indian anthropologists to tribal and caste studies. Contemporary nature of anthropological studies in India.
5. Approaches to the study of Indian society and culture - traditional and contemporary.
- 5.1 Aspects of Indian village. Social organisations of agriculture, impact of market economy on Indian villages.
- 5.2 Linguistic and religious minorities - social, political and economic status.
6. Tribal situation in India-biogenetic variability, linguistic and socio-economic characteristics of the tribal populations and their distribution. Problems of the tribal Communities-land alienation, poverty indebtedness, low literacy, poor educational facilities, unemployment, underemployment, health and nutrition. Developmental projects - tribal displacement and problems of rehabilitation;
7. Problems of exploitation and deprivation of Scheduled Castes/Scheduled Tribes and Other Backward Classes. Constitutional safeguards for Scheduled Tribes and Scheduled Castes. Social change and contemporary tribal societies; impact of modern democratic institutions, development programmes and welfare measures on tribals and weaker sections. Emergence of ethnicity, tribal movements and quest for identity. Pseudo-tribalism.
8. Social change among the tribes during colonial and post - Independent India.
- 8.1 Impact of Hinduism, Christianity, Islam and other religious on tribal societies.
- 8.2 Tribe and nation state - a comparative study of tribal communities in India and other countries.
9. History of administration of tribal areas, tribal policies, plans, programmes of tribal development and their implementation. Role of N.G.Os.
- 9.2 Contributions of anthropology to the understanding of regionalism, communalism and ethnic and political movements.

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 environments. Environmental pollution and associated hazards to crops, animals and humans. Cropping patterns 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, multistorey, 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.

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 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 rainfed agriculture area.

Water-use efficiency in relation to crop production, criteria for scheduling irrigations, 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 soil 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 agriculture 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 labourers; farm mechanization and its role in agricultural production and rural employment. Training programmes for extension workers; lab-to-land programmes.

AGRICULTURE PAPER-II

Seed technology, its importance. Different kinds of seeds and their seed production and processing techniques. Role of public and private sectors in 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, euploid and an euploids. 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 seeds 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 plants pigments; photosynthesis modern concepts and factors affecting the process, aerobic and non-aerobic respiration; C₃ 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 agriculture. Physiology of seed development and germination, dormancy.

Climatic requirements and cultivation of major fruits, plants, vegetable 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 plants 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 land 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.

CIVIL ENGINEERING PAPER-I

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 Co-ordinates, motion under uniform and non-uniform acceleration, motion under gravity. Kinetics of particle : Momentum and Energy principles, 'D'Alembert's Principle, Collision of elastic bodies, rotation of rigid bodies, simple harmonic motion, 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 : Macaulay'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 Rankine'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- Lamé's equations.

STRUCTURAL ANALYSIS :

Castigliano's theorems I and II, unit load method of consistent deformation applied to beams and pin jointed trusses. Slope-deflection, moment distribution, Kani's method of analysis and column Analogy method applied to indeterminate beams and rigid frames.

Rolling loads and 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, statistical method, Mechanism method.

Unsymmetrical bending : Moment of inertia, product of inertia, position of Neutral Axis and Principal axes, 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. Riveted, bolted and welded joints and connections. Design of tension and compression member, beams of built up section, riveted and welded plate girders, gantry girders, stanchions with battens and lacing, slab and gusseted column bases. Design of highway and railway bridges : Through and deck type plate girder, Warren girder, Pratt truss.

DESIGN OF CONCRETE AND MASONRY STRUCTURES :

Concept of mix design. Reinforced Concrete Working Stress and Limit State method of design- Recommendations of I.S. codes 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 based on working stress, loss of prestress. Design 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, flow net, 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-Stokes 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 non-uniform flows, momentum and energy correction factors 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 HYDRO POWER :

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, effective stress and pore water pressure, Darcy's Law, factors affecting permeability, determination of permeability, permeability of stratified soil deposits. Seepage pressure, quick sand condition, compressibility and consolidation, Terzaghi's theory of one dimensional consolidation, consolidation test. Compaction of soil, field control of compaction. Total stress and effective stress parameters, pore pressure coefficients. Shear strength of soils, Mohr Coulomb failure theory, Shear tests. Earth pressure at rest, active and passive pressures. Rankine'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 stress, 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, design criteria, choice of type of foundation, stress distribution in soils, Boussinesq's theory, Newmark's 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, pile 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.

CIVIL ENGINEERING

PAPER-II

Part-A : CONSTRUCTION TECHNOLOGY, EQUIPMENT, PLANNING; LAND MANAGEMENT

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. Plastic, 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.

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 : Weight batcher, mixer, vibration, batching plant concrete pump.

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

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, updating, cost analysis and resource allocation.

Elements of Engineering Economics, methods appraisal, present worth, annual cost, benefit cost, incremental analysis. Economy of scale and size. Choosing between alternatives including 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. Tachometry. Circular and transition curves. Principles of photogrammetry.

Railways : 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, super elevation, creep of rail, ruling gradient, tract resistance, tractive effort, relaying of track.

Highway Engineering : Principles of highway planning, Highway alignments, Geometrical design : Cross section, camber, super elevation, 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 sub-surface 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 : Hydrological 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, 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, reservoirs losses, reservoirs 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 unlined canals, drainage behind lining. Water logging : causes and control, drainage 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, Khosla'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 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.

Sewage systems : Domestic and industrial wastes, storm sewage-separate and combined systems, flow through sewers, design of sewers, sewer appurtenances manholes, inlets, 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, 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.

ELECTRICAL ENGINEERING

PAPER – I

Electrical Circuits – Theory and Applications.

Circuit components; network graphs; KCL; KVL; circuit analysis; methods; nodal analysis, mesh analysis; basic network theorems and applications; transient analysis; RL, RC and RLC circuits; sinusoidal steady state analysis; resonant circuits and applications; coupled circuits and applications; balanced 3-phase circuits. Two-port networks, driving point and transfer functions; poles and zeros of network functions. Elements of networks synthesis. Filter-theory design and applications. Active filters; Circuit simulation; Input formats; methods of education formulation; solution of equations; output formats; SPICE.

Signals & Systems

Representation of continuous-time and discrete time signals & systems; LTI systems; convolution; impulse response; time-domain analysis of LTI systems based on convolution and differential/difference equations. Fourier transform, Laplace transform, Z-transform, Transfer function. Sampling and recovery of signals DFT, FFT discrete-time systems.

E.M. Theory

Maxwell's equations, wave propagation in bounded media. Boundary conditions, refraction and reflection of plane waves.

Transmission line : Distributed parameter circuits, travelling and standing waves, impedance matching. Smith chart.

Wave guides : parallel plane guide. TE, TM and TEM waves, rectangular and cylindrical wave guides, resonator. Planar transmission lines; stripline, microstripline.

Analog Electronics

Characteristics and equivalent circuits (large and small-signal) of Diode, BJT, JFET and MOSFET. Diode circuits : clipping, clamping, rectifier; Biasing and bias stability. FET amplifiers Current mirror; Amplifiers, single and multi stage, differential operational, feedback and power Analysis of amplifiers; frequency-response of amplifiers. OPAMP configurations. Function generators and wave-shaping circuits, power supplies.

Digital Electronics

Boolean algebra; minimisation of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinational circuits, arithmetic circuits, code converters, multiplexers and decoders sequential circuits, latches and flip-flops, counters and shift-registers. Comparators, timers, multivibrators. Sample and hold circuits, ADCs and DACs. Semiconductor memories. Logic implementation using programmable devices (ROM, PLA, FPGA).

Energy Conversion : Principles of electromechanical energy conversion : Torque and emf in rotating machines. DC Machines : characteristics and performance analysis; starting and speed control of motors.

Transformers: principles of operation and analysis; regulation, efficiency; 3-phase induction machines and synchronous machines, characteristics and performance analysis, speed control. Special machines; Stepper motors, brushless dc motors, permanent magnet motors single-phase motors; FHP.

Power Electronics and Electric Drives :

Semiconductor power devices : diode, transistor, thyristor triac GTO and MOSFET-static characteristics and principles of operation; triggering circuits; phase control rectifiers, bridge converters, fully-controlled and half-controlled; principles of thyristor choppers and inverters, basic concepts of speed control of dc and ac motor drives ; applications of variable-speed drives.

Analog Communication

Random variables : continuous, discrete, probability, probability functions; Statistical averages, probability models; Random signals and noise white noise, noise equivalent bandwidth; signal transmission with noise, signal to noise ratio linear CW modulation : Amplitude modulation DSB, DSB-SC and SSB, Modulators and Demodulators; Phase and Frequency modulation, PM & FM signals, narrowband FM generation & detection of FM and PM, De-emphasis, Pre-emphasis. CW modulation system; Super heterodyne receivers, FM receivers, phase locked loop, SSB receiver signal to noise ratio calculation for AM and FM receivers.

Microwaves and Antenna

Electromagnetic radiation, propagation of waves, ground waves, sky wave, space wave, tropospheric scatter propagation. Extraterrestrial communications. Antenna : various types, gain, resistance, band-width, beam

width, and polarization, effect of ground. Antenna coupling, high frequency antennas; microwave antennas; special purpose antennas.

Microwave Services: Klystron, magnetron, TWT, gun diodes, Impatt, Bipolar and FETs. Microwave integrated circuits. Microwave measurements.

ELECTRICAL ENGINEERING PAPER II

Control Systems

Elements of control systems, block-diagram representation, open-loop & closed-loop systems, principles and applications of feed-back. LTI systems, time-domain and transform-domain analysis. Stability; Routh Hurwitz criterion, root-loci, Nyquist's criterion, Bode-plots, Design of lead-lag compensators. Proportional, PI, PID controllers. State-variable representation and analysis of control systems. Principles of discrete control systems.

Electrical Engineering Materials

Electrical/electronic behaviour of materials conductivity; free-electrons and band-theory, intrinsic and extrinsic semiconductor, p-n junction, solar cells super-conductivity. Dielectric behaviour of materials; polarization phenomena; piezo-electric phenomena. Magnetic materials, behaviour and application. Photonic materials; refractive index, absorption and emission of light, optical fibres, lasers and opto-electronic materials.

Microprocessors and microcomputers

8-bit microprocessor : architecture, CPU, module design, memory interfacing, I/O, Peripheral; controllers, multiprocessing. IBM PC architecture: overview, introduction to DOS, Advance microprocessors.

Measurement and Instrumentation

Error analysis, measurement of current voltage, power, energy, power-factor, resistance, inductance, capacitance and frequency, bridge measurements. Electronic measuring instruments, multimeter, CRO, digital voltmeter, frequency counter, Q-meter, spectrum-analyser. Distortion-meter.

Transducers : thermocouple, thermistor, LVDT, strain-gauge, piezo-electric crystal. Use of transducers in measurements of non-electrical quantities. Data-acquisition systems.

IC Technology :

Overview of IC Technology. Unit-steps used in IC fabrication, water cleaning, photo-lithography, wet and dry etching, oxidation, diffusion, non-implantation, CVD and LPCVD techniques for deposition of polysilicon, silicon, silicon-nitride and silicon di-oxide, metallisation and passivation.

Power Systems : Analysis and Control steady state performance of overhead transmission lines and cables; principles of active and reactive power transfer and distribution, per-unit quantities, bus admittance and impedance matrices, load flow, voltage control and power factor correction, economic operation, symmetrical and unsymmetrical faults. Concept of system stability, swing curves and equal area criterion. Static VAR system. Basic concepts of HVDC transmission; FACTS, Computer control and Automation, Introduction to energy control centres, various states of a power system; SCADA systems and RTUs. Active power control : Speed control of generator, tie-line control, frequency control. Economic dispatch.

Power system protection

Principles of over current, differential and distance protection. Concept of solid state relays circuit breakers. Computer aided protection : Introduction, line bus, generator, transformer protection; numeric relays and application of DSP to protection.

Non-conventional Energy Sources and Energy Management

Introduction to the energy problem; difficulties with conventional energy sources.

Wind Energy : Basics of Wind turbine aero-dynamics; wind-energy conversion systems and their integration into electrical grid.

Solar Energy : Thermal conversion: photo-voltaic conversion. Wave energy. Importance of Energy Management : Energy audit, energy economics, discount rate, pay-back period, internal rate of return, life cycle costing.

Digital Communication

Pulse code modulation (PCM), differential pulse code modulation (DPCM), delta modulation (DM), Digital modulation and demodulation schemes; amplitude, phase and frequency keying schemes, amplitude, phase and frequency keying schemes (ASK, PSK, FSK). Error control coding : error detection and correction, linear block codes, convolution codes. Information measure and source coding. Data networks, 7-layer architecture.

Satellite Communication, Radar and TV

Satellite Communication : General overview and technical characteristics, earth station equipment, satellite link design, CNR of Satellite system. Radar : Basic principles, Pulsed systems: CW Doppler radar, FMCW radar, Phase array radars. Television systems : Television systems and standards, Black and White and colour-TV transmission and receiver systems.

Fibre Optic System

Multiplexing : Time division multiplexing, Frequency Division multiplexing. Optical properties of materials : Refractive index absorption and emission of light, optical fibres, lasers and optoelectronic materials fibre optic links.

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 multicylinder 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, uniaxial loading, thermal stresses. Beams : Bending 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 and theories of failure. Rotating discs. Shrink fits.

3. Engineering Materials :

Basic concepts on structure of solids, crystalline materials, defects in crystalline materials, Alloys and binary phase diagrams, structure and properties of common engineering materials. Heat treatment of steels, plastics, ceramics and composite 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 ultrasonics. 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, Geographical 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 and elementary programming.

**MECHANICAL ENGINEERING
PAPER II**

1. Thermodynamics : Basic concepts. Open and closed systems, Applications of Thermodynamic Laws, Gas equations, Clapeyron equation, Availability, Irreversibility and Tds 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 carburation and fuel injection, engine emissions and control, solid, liquid and gaseous fuels, stoichiometric 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 convective 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 load calculations, solar refrigeration.

4. Turbo-machines and power plants :

Continuity, momentum and Energy Equations. Adiabatic and Isentropic flow, Fanno lines, Rayleigh lines. Theory and design of axial flow turbines and compressors, Flow through turbo-machine blade, 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.

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 distribution, stochastic independence of events and of random variables, expectation and moments of a random variable, conditional 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, Bhattacharyya's bounds, estimation by methods of moments, maximum likelihood, least squares, minimum chi-square 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 ratio test 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. Kolmogorov'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, 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 estimators, 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 per cell), CRD, RBD, LSD and their analyses, incomplete block designs, concepts of orthogonality and balance, BIBD, missing plot technique, factorial designs, $2n$, 32 , and 33 , confounding in factorial experiments, split-plot and simple lattice designs.

STATISTICS PAPER-II

I. Industrial Statistics

Process and product control, general theory of control charts, different types control charts for variables and attributes, \bar{X} , R , s , p , np and c charts, cumulative sum chart, V-mark, single, double, multiple and sequential sampling plans for attributes, OC, ASN, AOQ and ATI curves, concepts of producer's and consumer's risks, AQL, LTPD and AOQL, sampling plans for variables, use of Dodge-Romig 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, methods of solution (graphical and algebraic). Replacement of falling 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, Paasche's and Fisher's ideal index numbers, chain-base index number, uses and limitations of index numbers, index number of wholesale prices, consumer price index numbers, index number of agricultural and industrial production, tests 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 multicollinearity, consequences and solutions of multicollinearity, 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 system 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 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. Methods 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.

MEDICAL SCIENCE

PAPER-I

Section-A

I. Human Anatomy : Gross and microscopic anatomy and movements of shoulder, hip and knee joints; Blood supply, nerve innervation of hand, Lymphatic system; Karyotyping, medical genetics; Electron microscopic structure of glomerulus and muscle; Gross and microscopic anatomy and blood supply of lungs, heart, kidneys, liver, testis and uterus; Gross anatomy of pelvis, perineum and inguinal region. Cross-sectional anatomy of the body and mid-thoracic, upper abdominal, mid-abdominal and pelvic regions. Embryology : Major steps in the development of lung, heart, kidney, urinary bladder, uterus, ovary, testis and their common congenital abnormalities; Placenta and placental barrier.

Anatomy of central and peripheral autonomic nervous system :

Neural pathways for cutaneous sensations and vision; Cranial nerves, distribution and clinical significance; Anatomy of autonomic control of gastrointestinal, respiratory and reproductive systems.

II. Human Physiology : Central, peripheral and autonomic nervous system; Nerve and muscle excitation, conduction and transmission of impulse, mechanism of contraction, neurovascular transmission, EMG; Synaptic transmission, reflexes, control of equilibrium, posture and muscle tone descending pathways, functions of cerebellum, basal ganglia, reticular formation, hypothalamus limbic system and cerebral cortex; Physiology of sleep and consciousness, EEG.; Higher functions of the brain; Vision and hearing.

Endocrine system : Mechanism of action of hormones, formation, secretion, transport, metabolism, functions and regulations of secretion of pancreas and pituitary glands.

Physiology of reproductive system : menstrual cycle, lactation, pregnancy.

Blood : Development, regulations and fate of blood cells.

Cardio-vascular, respiratory gastro-intestinal and renal physiology : Cardiac excitation, spread of cardiac impulse, ECG., cardiac output, blood pressure, regulation of cardiovascular functions; Mechanics of respiration and regulation of respiration; Digestion and absorption of food, regulation of secretion and motility of gastrointestinal tract; Glomerular and tubular functions of kidney.

III. Biochemistry : pH and pK Henderson-Hasselbalch Equation; Properties and regulation of enzyme activity, role of high energy phosphates in bioenergetics; Sources, daily requirements, action and toxicity

of vitamins; Metabolism of lipids, carbohydrates, proteins, disorders of their metabolism; Chemical nature, structure, synthesis and functions of nucleic acids and proteins; Distribution and regulation of body water and minerals including trace elements; Blood Gas Analysis, GTT, Immuno electrophoresis, molecular structure of muscle contractile protein, oestrogen receptors.

Section-B

I. Pathology : Section of cell and tissue of injury, inflammation and repair , disturbances of growth and cancer. genetic diseases; Pathogenesis and histopathology of Rheumatic and ischaemic heart disease; Bronchogenic carcinoma, carcinoma breast, oral cancer, cancer colon. Lymphoma, leukaemia, liver cancer, meningioma and meningitis; Etiology, pathogenesis and histopathology of - Peptic ulcer, cirrhosis liver glomerulonephritis, lobar pneumonia, acute osteomyelitis, hepatitis, acute pancreatitis.

II. Microbiology : Growth of micro-organisms, sterilization and disinfection, bacterial genetics, virus-cell interactions; Immunological principles, acquired immunity, immunity in infections cause by viruses; Diseases caused by and laboratory diagnosis of Staphylococcus, enterococcus, salmonella, shigella, secheichiza, pseudomonas, vibrio, adenoviruses, herpes viruses (including rubella_ , fungi, protozoa, helminths, leptospiral infection.

III. Pharmacology : Drug receptor instruction, mechanism of drug action; Mechanism of action, dosage, metabolism and side effects of - Pilocarpine, terbutaline, metoprolol diazepam, acetylsalicylic acid, ibuprofen, furosemide, metronidazole. Chloroquin. Mechanism of action, dosage and toxicity of- Ampicillin, Cephalosporins, 1,2,3,4,th generations, Aminoglycoside, Doxycycline, chloramphenicol, rifampin, Calcium channel blocker, beta blocker, ace inhibitors, immunosuppressive therapy. Indications, dosage, side-effects and contraindications of- Methotrexate, vincristin, tamoxifen. Classification, route of administration, mechanism of action and side effects of - General anaesthetics, hypnotics, analgesics, Anti-viral, anti-fungal drugs.

IV. Forensic Medicine and Toxicology : Forensic examination of injuries and wounds; Physical and chemical examination of blood and seminal stains; Organo phosphorous poisoning, sedative overdose, hanging, drowning, burns, snake envenomation.

MEDICAL SCIENCE

PAPER-II

Section-A

1. General Medicine :

Etiology, clinical features, diagnosis and principles of management (including prevention) of:- Malaria, Typhoid, Cholera, Tetanus, Rabies, Exanthematous Fevers, Tuberculosis, AIDS.

Etiology, clinical features, diagnosis and principles of management of:

Rheumatic, ischaemic and congenital heart disease, hypertension. Cardiomyopathy, pulmonary embolism. Acute and chronic respiratory infections, bronchial asthma.

Occupational lung disease, pleural effusion, disseminated tuberculosis Malabsorption syndromes, acid peptic diseases, haemetemesis. Viral hepatitis, cirrhosis of liver, alcoholic liver disease.

Acute glomerulonephritis, chronic pyelonephritis, renal failure, nephrotic syndrome, renovascular hypertension, diabetes mellitus, anaemias, coagulation disorders, leukaemia, polycythemia and hyperviscosity syndrome, meningitis encephalitis, cerebrovascular diseases.

Role of Imageology in the work-up of medical problems, ultrasound, echo cardiogram, CT scan MRI.

Psychiatry : Common psychiatric disorders, schizophrenia. ECT, lithium

II. Paediatrics : Common paediatric problems, congenital cyanotic heart disease, respiratory distress syndrome, broncho pneumonias, kernicterus. Aids- prevention of vertical transmission.

III. Dermatology : Common skin diseases, psoriasis, Hansen's disease, fungal dermatitis, scabies, eczema, vitiligo, Steven Johnson's syndrome.

Section-B

I. General Surgery :

Clinical features, causes diagnosis and principles of management of:

Cervical lymph node enlargement, parotid tumour, oral cancer, cleft palate, hare lip.

Laryngeal tumour, esophageal tumours.

Peripheral arterial diseases, varicose veins, coarctation of aorta

Dysfunctions of thyroid parathyroids and adrenals.

Tumours of Thyroid, Parathyroid, Adrenal, Pituitary Glands.

Abscess of breast, cancer breast, fibroadenoma and adenosis

Acute and chronic appendicitis, bleeding peptic ulcer, tuberculosis of bowel, intestinal obstruction, ulcerative colitis.

Renal mass, acute retention of urine, benign prostatic hypertrophy.

Haemothorax, constrictive pericarditis

Splenomegaly, chronic cholecystitis, portal hypertension, liver abscess, peritonitis, carcinoma head of pancreas.

Direct and indirect inguinal hernias and their complications.

Fractures of femur and spine, Colles' fracture and bone tumours.

Organ transplantation, kidney, liver, heart, bone-marrow.

Laparoscopic Surgery.

II. Obstetrics and gynaecology including Family Planning.

Diagnosis of pregnancy, screening of high risk pregnancy, foetoplacental development.

Labour management, complications of 3rd stage, postpartum haemorrhage, resuscitation of the newborn.

Diagnosis and management of anaemia and pregnancy induced hypertension.

Principles of the following contraceptive methods.

Intra-uterine devices, pills, tubectomy and vasectomy. Medical termination of pregnancy including legal aspects.

Etiology, clinical features, diagnosis and principles of management of: Cancer cervix.

Leucorrhoea, pelvic pain, infertility, abnormal uterine bleeding, amenorrhoea.

III. Preventive and Social medicine.

Concept of causation and control of disease in the community, principles and methods of epidemiology.

Health hazards due to environmental pollution and industrialisation.

Normal nutrition and nutritional deficiency diseases in India.

Population trends (World and India),

Growth of population and its effect on health and development.

Objectives, components and critical analysis of each of the following National programmes for the control/eradication of:

Malaria, filaria, kala-azar, leprosy, tuberculosis, cancer, blindness, iodine deficiency disease, AIDS & std and guinea worm.

Objectives, components critical analysis of each of the following national Health and Family Welfare Programmes:

Maternal and child health

Family welfare

Nutrition, Immunization.

ANIMAL HUSBANDRY AND VETERINARY SCIENCE
PAPER-I

1. Animal Nutrition-Energy sources, energy, metabolism and requirements for maintenance and production of milk, meat, eggs and wool. Evaluation of feeds as sources of energy.
 - 1.1. Trends in protein nutrition: sources of protein metabolism and synthesis, protein quantity and quality in relation to requirements. Energy protein ratios in ration.
 - 1.2. Minerals in animal diet : Sources, functions, requirements and their relationship of the basic minerals nutrients including trace elements.
 - 1.3. Vitamins, Hormones and Growth Stimulating, substances : Sources, functions, requirements and inter-relationship with minerals.
 - 1.4. Advances in Ruminant Nutrition-Dairy Cattle: Nutrients and their metabolism with reference to milk production and its composition. Nutrient requirements for calves, heifers, dry and milking cows and buffaloes. Limitations of various feeding systems.
 - 1.5. Advances in Non-Ruminant Nutrition-Poultry-Nutrients and their metabolism with reference to poultry, meat and egg production, Nutrients requirements and feed formulation and broilers at different ages.
 - 1.6. Advances in Non-Ruminant Nutrition-Swine-Nutrients and their metabolism with special reference to growth and quality of meat production, Nutrient requirement and feed formulation for baby-growing and finishing pigs.
 - 1.7. Advances in Applied Animal Nutrition-A critical review and evaluation of feeding experiments, digestibility and balance studies. Feeding standards and measures of food energy. Nutrition requirements for growth, maintenance and production. Balanced rations.
2. **Animal Physiology**
 - 2.1 Growth and Animal Production :-Prenatal and postnatal growth, maturation, growth curves, measures of growth, factors affecting growth, conformation, body composition, meat quality.
 - 2.2 Milk Production and Reproduction and Digestion : Current status of hormonal control of mammary development, milk secretion and milk ejection. Male and Female reproduction organ, their components and function. Digestive organs and their functions.
 - 2.3 Environmental Physiology : Physiological relations and their regulation; mechanisms of adaption, environmental factors and regulatory mechanism involved in animal behaviour, methods of controlling climatic stress.
 - 2.4 Semen quality : Preservation and Artificial Insemination-Components of semen, composition of spermatozoa, chemical and physical properties of ejaculated semen, factors affecting semen in vivo and in vitro. Factors affecting semen production and quality preservation, composition of diluents, sperm concentration, transport of diluted semen. Deep Freezing techniques in cows, sheep and goats, swine and poultry. Detection of oestrus and time of insemination for better conception.
3. **Livestock Production and Management :**
 - 3.1 Commercial Dairy Farming-Comparison of dairy farming in India with advanced countries. Dairying under fixed farming and as a specialised farming, economic dairy farming, Starting of a dairy farm. Capital and land requirement, organisation of the dairy farm.
Procurement of goods; opportunities in dairy farming, factors determining the efficiency of dairy animal, Herd recording, budgeting, cost of milk production; pricing policy; Personnel Management. Developing Practical and Economic ration for dairy cattle; supply of greens throughout the year, field and fodder requirements of Dairy Farm, Feeding regimes for day and young stock and bulls, heifers and breeding animals, new trends in feeding young and adult stock; Feeding records.

- 3.2. Commercial meat, egg and wool production: Development of practical and economic rations for sheep, goats, pigs, rabbits and poultry. Supply of greens, fodder, feeding regimens for young and mature stock. New trends in enhancing production and management. Capital and land requirements and socio-economic concept.
- 3.3. Feeding and management of animals under drought, flood and other natural calamities.

4. Genetics and Animal Breeding :

Mitosis and Meiosis; Mendelian inheritance; deviations to Mendelian genetics; Expression of genes; Linkage and crossing over; Sex determination, sex influenced and sex limited characters; Blood groups and polymorphism; Chromosome aberrations; Gene and its structure; DNA as a genetic material; Genetic code and protein synthesis; Recombinant DNA technology, Mutations, types of mutations, methods for detecting mutations and mutation rate.

- 4.1 Population Genetics Applied to Animal Breeding: Quantitative Vs. qualitative traits; Hardy Weinberg Law; Population Vs. individual; Gene and genotypic frequency; Forces changing gene frequency; Random drift and small populations; Theory of path coefficient; Inbreeding, methods of estimating inbreeding coefficient, systems of inbreeding; Effective population size; Breeding value, estimation of breeding value, dominance and epistatic deviation; partitioning of variation; Genotype X environment correlation and genotype X environment interaction; Role of multiple measurements; Resemblance between relatives.
- 4.2 Breeding Systems : Heritability, repeatability and genetic and phenotypic correlations, their methods of estimation and precision of estimates; Aids to selection and their relative merits; Individual, pedigree, family and within family selection; Progeny testing; Methods of selection; Construction of selection indices and their uses; Comparative evaluation of genetic gains through various selection methods; Indirect selection and Correlated response; Inbreeding, upgrading, cross-breeding and synthesis of breeds; Crossing of inbred lines for commercial production; Selection for general and specific combining ability; Breeding for threshold character.
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ANIMAL HUSBANDRY AND VETERINARY SCIENCE PAPER-II

1. Health and Hygiene

- 1.1. Histology and Histological Techniques : Stains-Chemical classification of stains used in biological work-principles of staining tissues- mordants-progressive & regressive stains-differential staining of cytoplasmic and connective tissue elements-Methods of preparation and processing of tissues-celloidin embedding-Freezing microtomy-Microscopy- Bright field microscope and electron microscope. Cytology-structure of cell, organelles & inclusions; cell division-cell types-Tissues and their classification-embryonic and adult tissues-Comparative histology of organs:- vascular, Nervous, digestive, respiratory, musculo-skeletal and urogenital systems-Endocrine glands-Integuments-sense organs.
- 1.2. Embryology : Embryology of vertebrates with special reference to aves and domestic mammals-gametogenesis-fertilization-germ layers-foetal membranes & placentation-types of placenta in domestic mammals- Teratology-twin & twinning-organogenesis-germ layer derivatives- endodermal, mesodermal and ectodermal derivatives.
- 1.3. Bovine Anatomy-Regional Anatomy : Paranasal sinuses of OX-surface anatomy of salivary glands. Regional anatomy of infraorbital, maxillary, mandibuloalveolar, mental & coronal nerve block-Regional anatomy of paravertebral nerves, pudendal nerve, median, ulnar & radial nerves-tibial, fibular and digital nerves-Cranial nerves-structures involved in epidural anaesthesia-superficial lymph nodes-surface anatomy of visceral organs of thoracic, abdominal and pelvic cavities-comparative features of locomotor apparatus & their application in the biomechanics of mammalian body.
- 1.4. Anatomy of Fowls : Musculo-skeletal system-functional anatomy in relation to respiration and flying, digestion and egg production.
- 1.5. Physiology of blood and its circulation, respiration; excretion, Endocrine glands in health and disease.
 - 1.5.1 Blood constituents : Properties and functions-blood cell formation- Haemoglobin synthesis and chemistry-plasma proteins production, classification and properties; coagulation of blood; Haemorrhagic disorders- anticoagulants-blood groups-Blood volume-Plasma expanders-Buffer systems in blood. Biochemical tests and their significance in disease diagnosis.
 - 1.5.2. Circulation: Physiology of heart, cardiac cycle-heart sounds, heart beat, electrocardiograms, Work and efficiency of heart-effect of ions on heart function-metabolism of cardiac muscle, nervous and chemical regulation of heart, effect of temperature and stress on heart, blood pressure and hypertension, Osmotic regulation, arterial pulse, vasomotor regulation of circulation, shock. Coronary & pulmonary circulation, Blood-Brain barrier- Cerebrospinal fluid-circulation in birds.
 - 1.5.3 Respiration : Mechanism of respiration, Transport and exchange of gases-neural control of respiration-chemoreceptors-hypoxia-respiration in birds.
 - 1.5.4 Excretion: Structure and function of kidney - formation of urine, methods of studying renal function-renal regulation of acid-base balance; physiological constituents of urine-renal failure-passive venous congestion-Urinary recreation in chicken-Sweat glands and their function. Biochemical tests for urinary dysfunction.
 - 1.5.5 Endocrine glands : Functional disorders, their symptoms and diagnosis. Synthesis of hormones, mechanism and control of secretion- hormonal receptors-classification and function.
- 1.6. General knowledge of pharmacology and therapeutics of drugs : Cellular level of pharmacodynamics and pharmaco-kinetics-Drugs acting on fluids and electrolyte balance-drugs acting on Autonomic nervous system- Modern concepts of anaesthesia and dissociative anaesthetics-Autocoids-Antimicrobials and principles of chemotherapy in microbial infections-use of hormones in therapeutics-chemotherapy of parasitic infections-Drug and economic persons in the Edible tissues of animals-chemotherapy of Neoplastic diseases.

- 1.7. Veterinary Hygiene with reference to water, air and habitation : Assessment of pollution of water, air and soil-Importance of climate in animal health-effect of environment on animal function and performance- relationship between industrialisation and animal agriculture-animal housing requirements for specific categories of domestic animals viz. pregnant cows & sows, milking cows, broiler birds-stress, strain & productivity in relation to animal habitation.
2. **Animal Diseases :**
 - 2.1 Pathogenesis, symptoms, postmortum lesions, diagnosis, and control of infection diseases of cattle, pigs and poultry, horses, sheep and goats.
 - 2.2 Etiology, symptoms, diagnosis, treatment of production diseases of cattle, pig and poultry.
 - 2.3 Deficiency diseases of domestic animals and birds.
 - 2.4 Diagnosis and treatment of nonspecific condition like impaction, Bloat, Diarrhoea, Indigestion, dehydration, stroke, poisoning.
 - 2.5 Diagnosis and treatment of neurological disorders.
 - 2.6 Principles and methods of immunisation of animals against specific diseases-hard immunity-disease free zones-'zero' disease concept- chemoprophylaxis.
 - 2.7 Anaesthesia-local, regional and general-preanaesthetic medication, Symptoms and surgical interference in fractures and dislocation, Hernia, choking, abomassal displacement-Caesarian operations, Rumenotomy- Castrations.
 - 2.8 Disease investigation techniques-Materials for laboratory investigation- Establishment Animal Health Centres-Disease free zone.
3. **Veterinary Public Health**
 - 3.1 Zoo noses : Classification, definition; role of animals and birds in prevalence and transmission of zoonotic diseases-occupational zoonotic diseases.
 - 3.2. Epidemiology : Principles, definition of epidemiological terms, application of epidemiological measures in the study of diseases and disease control, Epidemiological features of air, water and food borne infections.
 - 3.3 Veterinary Jurisprudence : Rules and Regulations for improvement of animal quality and prevention of animal diseases-state and control Rules for prevention of animal and animal product borne diseases-S.P.C.A.-veterolegal cases-certificates-Materials and Methods of collection of samples for veterolegal investigation.
4. **Milk and Milk Products Technology :**
 - 4.1 Milk Technology : Organization of rural milk procurement, collection and transport of raw milk. Quality, testing and grading raw milk, Quality storage grades of whole milk, Skimmed milk and cream. Processing, packaging, storing, distributing, marketing defects and their control and nutritive properties of the following milks : Pasteurized, standardized, toned, double toned, sterilized, homogenized, reconstituted, recombined and flavoured milks. Preparation of cultured milks, cultures and their management, yoghurt, Dahi, Lassi and Srikhand. Preparation of flavoured and sterilized milks. Legal standards, Sanitation requirement for clean and safe milk and for the milk plant equipment.
 - 4.2 Milk Products Technology : Selection of raw materials, assembling, production, processing, storing, distributing and marketing milk products such as Butter, Ghee, Khoa, Channa, Cheese; Condensed, evaporated, dried milk and baby food; Ice cream and Kulfi; by products; whey products, butter milk, lactose and casein. Testing Grading, judging milk products-BIS and Agmark specifications, legal standards, quality control nutritive properties. Packaging, processing and operational control Costs.

5. Meat Hygiene and Technology :

5.1 Meat Hygiene :

5.1.1 Ante mortem care and management of food animals, stunning, slaughter and dressing operations; abattoir requirements and designs; Meat inspection procedures and judgement of carcass meat cuts-drading of carcass meat cuts-duties and functions of Veterinarians in Wholesome meat production.

5.1.2 Hygienic methods of handling production of meat-spoilage of meat and control measures-Post slaughter physicochemical changes in meat and factors that influence them-quality improvement methods-Adulteration of meat and defection-Regulatory provisions in Meat trade and Industry.

5.2. Meat Technology

5.2.1 Physical and chemical characteristics of meat-meat emulsions-methods of preservation of meat-curing, canning, irradiation, packaging of meat and meat products; meat products and formulations.

5.3. Byproducts : Slaughter house by products and their utilisation-Edible and inedible byproducts-social and economic implications of proper utilisation of slaughter house byproducts-Organ products for food and pharmaceuticals.

5.4. Poultry Products Technology : Chemical composition and nutritive value of poultry meat, pre slaughter care and management. Slaughtering techniques, inspection, preservation of poultry meat, and products. Legal and BIS standards. Structure, composition and nutritive value of eggs. Microbial spoilage. Preservation and maintenance. Marketing of poultry meat, eggs and products.

5.5. Rabbit/Fur Animal farming : Care and management of rabbit meat production. Disposal and utilization of fur and wool and recycling of waste byproducts. Grading of wool.

6. Extension : Basic philosophy, objectives, concept and principles of extension. Different Methods adopted to educate farmers under rural conditions. Generation of technology, its transfer and feedback. Problems of constraints in transfer of technology. Animal husbandry programmes for rural development.

SCHEDULE - II**APPLICATION FORM FOR COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE JUNIOR GRADE OF MIZORAM CIVIL SERVICE**

Before filling up of the Application form the Candidates must carefully study the Examination Regulations and other Instructions issued by the Commission and abide by them.

(To be filled in by the Candidate's own Handwriting).

1. Name (as recorded in matriculation or equivalent certificate) (In block letters) : _____
2. Father's name : _____
3. Address : _____
(a) Permanent/Home Address : _____
(b) Present address (for Communication) : _____
4. Date of birth in Christian era (as recorded in matriculation or equivalent Certificate) (Attach Supporting documents). :

Date	Month	Year
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5. Sex (write 'M' for Male and 'F' for Female in the box). :
6. Nationality : _____
7. Community : _____
(Scheduled Caste or scheduled Tribe)
8. Educational and other qualifications from matriculation (Attach supporting documents). :

Examination Passed	Year of Passing	Division/Class	Percentage of marks obtained	Board of University
1	2	3	4	5

9. If reservation/relaxation is claimed _____ indicate which scheduled caste/scheduled Tribe etc.
10. If you are employed under Government, or have at any time been employed under Government give details of the Service rendered in various Offices and scale of pay of the post held :-

Name of Deptt/Office	Post in which employed and scale of pay	Period of Service
1	2	3

11. Have you ever been convicted by a criminal court or penalised in the Disciplinary action and if so, in what circumstances and what was the sentences/penalty.
12. Indicate 2 (two) optional subjects in which : (1)
you wish to be examined. No change in the
selection of Optional : (2)
13. Give list of documents attached to the applicant (SC/ST Certificate, educational qualification certificates, Mark sheets, Treasury Challan etc).

1)

2)

3)

4)

5)

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7)