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NOTIFICATION

No.A. 12018/1/85 - P&AR(GSW), the 6th October, 2008. In exercise of the powers conferred by the proviso to Article 309 of the Constitution of India, the Governor of Mizoram is pleased to make the following rules regulating the recruitment and conditions of service of persons appointed to the Mizoram Finance and Accounts Service, namely :-

PART - I PRELIMINARY

1. SHORT TITLE AND COMMENCEMENT :

- (1) These Rules may be called the Mizoram Finance and Accounts Service Rules, 2008.
- (2) They shall come into force from the date of publication in the Official Gazette.

2. DEFINITIONS :

In these rules, unless the context otherwise requires :-

- (a) "Commission" means the Mizoram Public Service Commission;
- (b) "Constitution" means the Constitution of India;
- (c) "Duty Post" means any post specified in Schedule-II and it includes a temporary post carrying the same designation and pay as any of the post specified in that Schedule and any other temporary post declared as duty post by the Governor;
- (d) "Gazette" means the Mizoram Gazette;
- (e) "Government" means the Government of Mizoram;
- (f) "Member of Service" means a person appointed in a substantive capacity to any grade of the Mizoram Finance and Accounts Service and includes a person appointed on probation to the Mizoram Finance and Accounts Service in accordance with these Rules;
- (g) "Schedule" means the Schedule appended to these Rules;
- (h) "Scheduled Castes" means such castes as are specified by the President of India under the first Schedule to the State of Mizoram Act 1986 (Central Act No. 34 of 1986);

PHILOSOPHY

PAPER 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 'T' 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.

PAPER II

Socio-Political Philosophy and Philosophy of 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 Satyagraha.
3. Traditional, change and Modernity with reference to Indian Social Institutions.
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 Religious; Religions tolerance; Conversion Secularism.
6. Moksha-Pathing 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 lib systems 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 Experiment, Lorentz Transformations addition theorem of velocities. Variation of mass with Velocity. Mass-energy equivalence, Fluid dynamics, streamlines, turbulence, Bernoulli's Equation with simple applications.

2. THERMAL PHYSICS :

Laws of Thermodynamics Enrophy, 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 heat of gases mean Free Path, Brownian Motion. Black Body radiation specific heat of solids Emataia & Derby theories, Wein's Law Planck's Law, Solar Constant. Thermanization and Steiler spectra. Production of Law, temperatures using adiabtic demagnatization and dilution refrigeration, concept of negative temperature.

3. WAVES AND OSCILLATIONS :

Oscilations; Singile harmonic motion, stationary and travelling waves, Damped harmonic motion, Forced Oscililation & Resonanc Wave equation, Harmonic Solutions, Plane and Spherical waves, superposition of waves. Phase and Group velocities, Beats; Huygens principle, insterference, Diffraction Fresnel & Fraunhofer Diffraction by streigat edge, Single and Multiple slits. Resolving power of grating and Optical Instruments thyveigh Critcrion, Polarization, Production and Detection of polarized light (linear, circular, and elliptical). Leser sources (Helium-Neon, Ruby and semiconductor diode), Concepts of spatial and temporal coherence. Diffraction as a Fourier Transformation. Fiesnel and Fraunhofer diffraction by rectangular and circular spertures, Holography; theory and applications.

PAPER II**ELECTRICITY & MAGNENSAN MCDER PHYSICS AND ELECTRONICS****1. ELECTRICITY & MAGNETISM**

Coulomb's law Electric field, Guasels law, Electric-potential, Poisson and Laplace equations for a homogeneous dietearic, uncharged conducting sphere in a uniform field, Point charge and infinite conducting Plane. Magnetic shell. Magnetic induction and field strength. Blot-Savart law and application. Electro-magnetic induction, Faraday's and Lenz's laws, Self and mutual inductances. Alternating currents. LCR circuits, series and parallel resonance circuits, quality factor, Kirchoff laws with applications, Marwell's equations and electromagnetic waves. Transverse nature of electromagnetic waves. Pointing vector. Magnetic field in matter-dia, para, ferro, antiferro and ferri magnetism (qualitative approach only.)

2. MODERN PHYSICS :

Bohl'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, Zeeman 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. Debrogile waves, Wave-Particle quality and uncertainty principle. Schrodinger wave equation with application to (i) particle in a box, (ii) motion across a step potential One dismensional harmonicoscillator, 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 fussion. Reaction physics Elementary particles and their classification. Strong and weak Electromagnetic interactions. Particle accelerator; cycotron, Lenior accelerators, Elementary ideas of Super-conductivity.

3. ELECTRONICS :

Band theory of solids-conductors, insulators semiconductors, Intrinsic and ex-intrinsic semiconductors, P-N junction, Thermistor zenner diodes reverse and forward biased P-N Junction solar cell.

Use of diodes and transistors for rectification, amplification oscillation, modulation and detection of r.f. waves. Transistor receivers, Television, Logic Gates.

PSYCHOLOGY

PAPER I

FOUNDATION ON 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 socialisation. Concept of National Character.

4. Cognitive Processes :

Perception, Theories of perception. Perception organisation. 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. Desomination and generalisation. 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. Information 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 aspiration. 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 Scale; Psychometric Tests; Protective Tests; Observation method.

11. **Language and Communication :**
Psychological basis of language. Theories of language Development. Skinner and Chumsky. 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 attitude. Attitudes measurement. Types of attitude scales. Theories of attitude change values, Types of values, Motivational properties of values. measurement of values.
13. **Recent Trends :**
Psychology and the Computer Cyclic model of behaviour. Simulation studies in psychology. Study of consciousness. Altered states of consciousness, Sleep, dream, meditation and hypnotic trance; drug induced changes, Sensory deprivation. 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.**

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 tests, Limitations of psychological tests.
2. **Psychological Disorders**
Classifications of Disorders and mesological 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. **Applications 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, Groups 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 of change. The concept of change proneness.
7. **Psychology and the Learning process.**
The learner, School as an agent of socialisation. Problems relating to adolescents learning situations. Gifted and retarded children and Problems related to their training.
8. **Disadvantage Groups.**
Types: Social, cultural and economic, psychological consequences of disadvantages. 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 of prejudice. Nature and prejudice manifestation of prejudice. Development of prejudice. Measurement of prejudice. Amediation of prejudice. Prejudice and personality. Step to achieve social integration.
10. Psychology and Economic Development. The nature of achievement motivation. Motivating people for achievement, Promotion of inter-preneurship. 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

1. **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 art and a Science; New Public Administration.
2. Theories of Organisation-Scientific management (Taylor and his Associates) The Bureaucracy 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) Behavioural Approach. Systems Approach, Organisational Effectiveness.
3. Principles of Organization-Hierarchy, Unity of Command, Authority and Responsibility, Co-ordination, Span of Control, Supervision, Centralization and Decentralization, Delegation.
4. Administrative Behaviour - Decision making with Special Reference to the contribution of Herbert Simon, Theories of Leadership; Communication; Morale; Motivation (Maslow and Herzberg).
5. Structure of Organisation - Chief Executive, Types of Chief Executive and their function; Line, Staff and Auxiliary agencies; Department; Corporations, Companies, Boards and Commissions. Headquarters and field relationship.
6. Personnel Administration - Bureaucracy and Civil Services; Position Classification; Recruitment; Training; Career Development; Performance Appraisal; Promotion; Pay and Service Condition; Retirement Benefits; Discipline; Employer-Employee Relations, Integrity in Administration, Generalists and Specialists Neutrality and Anonymity.
7. Financial Administration-Concept of Budget, Preparation and Execution of the Budget; Performance Budget; Legislative Control; Accounts and Audit.
8. Accountability and Control-The concepts of Accountability and Control; Legislative, Executive and Judicial Control over Administration, Citizen and Administration.
9. Administrative Reforms - O & M Work Study; Work Measurement; Administrative Reforms; Processes as and Obstacles.

10. Administrative Law - Importance of Administrative law, Delegated Legislation; Meaning, Types, Advantages, Limitations, Safeguards, Administrative Tribunals.
11. Comparative and Development Administration - Meaning, Nature and Scope of 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.
12. Public Policy - Relevances of Policy Making in Public Administration. The process of Policy Formulation and Implementation.

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 Commissions, Field Organisations.
- V. Central-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 attitude.

Pioneering contributions of Sociology : The seminal ideas of Durkheim, Weber, Red-Cliffle Brown, Malinowski, Persons, Merton and Mars 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 conflicts.

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 organisations : 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 systems : The nature of social power community power structure, power of the elite, class power, organization power, power of unorganised masses; power authority and legitimacy, power in democracy and in totalitarian society; political parties and voting.

Educational systems, 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.

Religious : The religious phenomenon, the sacred and the profane; social functions and disfunctions of religion; magic religion and science; changes in society and changes in religion secularization.

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.

PAPER II**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, 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; the Joint family-its structural and functional aspects and its changing form 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, intergenerations 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 and 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 contexts, educational inequality and change; education and social and mobility, educational problems of Women, the Backward Classes and the Schedule Castes.

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

Tribal societies 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 of Green Revolution; New Strategies of rural development.

Urban social organisation : Continuity and change in the traditional cases of social organisation, 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 social-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-in-undergenerational 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; problems of change and modernization-structural contradictions and breakdowns.

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

ZOOLOGY

PAPER I

Non Chordata and Chordata, 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, Monocystis, 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, metagenesis, phylogenetic relationship of Cnidaria and Acnidaria.
5. HELMINTHS : Structure and life history of Planaria, Fasciola, Taenia and Ascaris Paratic adaptation, Helminths in relation to man.
6. ANNELIDA : Neries, earthworm and leech; coelom and metamerism; modes of life in polychaetes.
7. ARTHROPODA : Pulemon, 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, cephalopodes.
9. ECHINODERMATA : General organization, larval forms and affinities of Echinodermata.
10. General Organisation, and characters, outline classification and inter-relationship of phletochordata, Pisces, Amphibia, Reptilia Aves and mammalia
11. Noteny 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 Urodele and Apoda.
15. Origin of Reptiles; adaptive radiation in reptiles fossils reptiles; poisonous and snakes of India; poison apparatus of snakes.
16. Origin of birds; flightless birds; arial adaptation and migration of birds.
17. Origin of mammals : homologics of aerossicles in mammals; dentition and skin derivatives in mammals; distribution; structural peculiarities and phylogenetic relations of Prototheria and Methatheria.

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, biogeo-chemical, 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 and 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 Chisquare and to t-test

Economic Zoology :

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

PAPER II

Cell Biology Genetics, Evolution and Systemic, Bio-Chemistry, Physiology and Embryology

Section 'A'**Cell Biological Genetics, Evolution and Systematic**

1. Cell Biology Structure and function of cell and cytoplasmic constituents; structure of nucleus, plasma membrane, mitochondria, golgibodies, endo-plas-tic reticulum and rebosomes, cell division; mtotic 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-Mantelian laws of inheritance re-combination linkage and linkage maps, multiple; alleys; mutation natural and induced) mutation and evolution meiosis, chromosomet number and form, structural rearrangements, ploypodiy; cytotoklasmic inheritance, regulations of gene expression in prokaryotes, and eukaroystes; biochemical genetic, elements of human genetics; normal and abnormal karyotypes; genes and diseases, Eugenics.

3. Evolution and systematic-Origin of life, history of evolutionary through Lamarck and his works, Darwin and his works, source and nature of organic variation. Natural selection Hardy Weaiberg law, cryptic and warning coloration mimicry; isolating mechanisms and their role. Insular fana, concept of species, 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 zoogeo-graphical realms of the world.

Section 'B'

Biochemistry ; Physiology and Embryology

1. Biochemistry : Structure of carbohydrates, lipids, aminoasids, proteins and nucleic acids, glycolysis and krebs cycle, 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 action, immunglobulins and immunity, vitamins and corenzymes hormones, their classification, byosynthesis and functions.
2. Physiology with special reference to mammals, composition of blood, blood groups in man, coagulation, oxygen and corbondioxide transport, haemoglobin, breathing and its regulation, nephron and urine formation, acid-base balance and honeostasis, temperature regulation in man, mechanism of conduction along axon and across synapses, neurotransmitters, vision, hearing and other receptors, types of muscles, ultrastructures and mechanism of contraction of skeletal muscle, role of salivary gland, liver, pancreas and intestinal glands and digestion, obsorption of digested food, nutrition and balanced diet of man, mechanism of action steroids and peptize hormones, role of hypothalamus, pituitary thyroid, parathyroid, pancreases adrenal testis, ovary and fines organs and their inter relationship, physiology of reproduction in humans, hormonal control of development in man and insects, phero-mens in insects and mammals.
3. Embryology ; Gametogonesis, fertilization, types of eggs, cleavage, development upto gastruction in branch ostoma, frog and chick, Fate maps of frogs and chick; metamorphosis in frog. Formation and fate of extra embryonic membrane in chicks; Formation of anmion ailantoise and types of placenta in mammals, function of placenta in mammals; Organisers, Regeneration, genetic control of development Organogenesis of central nervous system, sense organs, heart and kidney of vertebrate embryos. Agging and its implication in relation to man.

AGRICULTURE PAPER - I

Ecology and its relevance to man. natural resources, their sustainable management and conservation. Physical and social environment as factors of crop distribution and production. Climatic elements as factors of crop growth, Impact of changing environment on cropping pattern as Indicators of environments. Environmental pollution and associated hazards to crops, animals, and humans. Cropping 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 crop-ping, multistorey. relay and inter-cropping and their importance in relation to food production. Package of practices for production of important cereals, pulses, oil seeds, fibers, sugar, commercial and fodder crops grown during Kharif and Rabi seasons in different regions of the country.

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

Weeds, their characteristics, dissemination and association with various crops; their multiplication; 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 fertilizer use, integrated nutrient management. Losses of nitrogen in soil, nitrogen-use efficiency in submerged rice soils, nitrogen fixation in soils, Fixation of phosphorus and potassium in soil 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 stabilizing agriculture production in rained 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 agricultural Inputs and outputs, price fluctuations and their cost; role of co-operatives in agricultural economy; types and systems of farming and factors affecting them. Agricultural extension, its importance and role, methods of evaluation of extension programmes, socio-economic survey and status of big, small, and marginal farmers and landless agricultural labourers; farm mechanization and its role in agricultural production and rural employment. Training programmes for extension workers; lab-to-land programmes.

PAPER – II

Cell Theory. Cell structure, cell organelles and their function, cell division, nucleic acids structure and function, gene structure and function. Laws of heredity, their significance in plant breeding. Chromosome structure, chromosomal aberrations, linkage and cross over, and their significance in recombination breeding. Polyploidy, 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 seed production, processing and marketing in India.

Physiology and its significance in agriculture, imbibition, surface tension, diffusion and osmosis. Absorption and translocation of water, transpiration and water economy. Enzymes and plant pigments; photosynthesis modern concepts and factors affecting the process, aerobic and nonaerobic respiration; C₃, C₄ and CAM mechanisms. Carbohydrate, protein and fat metabolism.

Growth and development; photoperiodism and vernalization. Auxins, hormones, and other plant regulators and their mechanism of action and importance in agriculture. Physiology of seed development and germination; dormancy

Climatic requirements and cultivation of major fruits, plants, 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. Biological control of pests and diseases. Integrated pest and disease management. Epidemiology and forecasting.

Pesticides, their formulations and modes of action. Compatibility with rhizobial inoculants, Microbial toxins.

Storage pests and diseases of cereals and pulses. and their control.

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

ANTHROPOLOGY

PARER – I

- 1.1 Meaning and scope of 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) Social-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 systematic and taxonomy, major primate taxa, tertiary and quaternary fossil primates, Systematics of Hominoidea and Hominiidae, Origin and evolution of man - 'Homo erectus and Homo sapiens'.
- 1.5 Phylogenetics status, characteristics and distribution of the following:
- a) Prepleistocene fossil primates-Oreopithecus.
 - b) South and East African hominids-Plesanthropus/Australopithecus Africaus, Paranthropus, Australopithecus.
 - c) Paranthropus-Homo erectus-Homoerectus javanicus, Homo erectus pekinensis.
 - d) Homo Hidelbergensis.
 - e) Neanderthal man-La-chapelle-aus-saints (Classical type), Mt. Carmelites types (Progressive type).
 - f) Rhodesian man
 - g) Homo sapiens-Cromognon, Grimaldi, Chancelade.
- Recent advances in understanding the evolution, distribution and multi disciplinary 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) Paleolithic
 - 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 structures 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 critique.
- 2.2. Concept of kinship : Definition of kin, incest prohibition exogamy and endogamy. Principles of descent-types and functions. Political and jural aspects of kinship. Unineal, bilateral and double descent. Descent, filiations and complementary filiations. 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.
- 3.4 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, saman, 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 Meanings, cope and relevance – Principles governing production, distribution and consumption in communities subsisting on hunting gathering, fishing pastoralism, horticulture and other economic pursuits. Formalist and substantivist debate-Dalton, Karl-polyanny and Marx approach and New Economic Anthropology exchange gifts, border trade, ceremonial exchange and market economy
- 5.2 Theoretical foundations. Types of political organization -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. Concept of participation development. Cultureecology and sustainable development. Dispalcement and rehabilitation.
- 7.1 Concept of research in anthropology. Subjectivity and flexivity in terms of gender class, ideology and ethics. Distinction between methodology, methods and techniques. Nature and explanation in anthropological research. Positivistic and non-positivistic approaches. Comparative methods; nature, purpose and methods of comparison in social and cultural anthropology. Basic techniques of data collection. Interview, partici-pant and other forms of observation, schedules, questionnaire, case-study methods, extended case study methods, life histories and secondary sources, oral history, genea-logical 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 (pedegree 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 Mandolian genetics in man-family study, single factor, multifactor, lethal, sub-lethal, and polygenic inheritance in man.
- 8.5 Concept of genetic polymorphism and selection. Mandolian population, Hardy Weinberg law; causes and changes which bring down frequency-mutation, isolation, migration, selection, inbreeding and genetic drift. Consanguineous and non-consanguineous mating, genetic load, genetic effect of consanguineous and cousin marriage (statistical and probability methods for study of human genetics).

- 8.6 Chromosomes and chromosomal abbreviation in man, methodology.
- a) Numerical and structure aberrations (disorders)
 - b) Sex chromosomal aberrations-Hunsfellar (XXY), Tumor (XO) Superfemale (XXX), intersex and other syndromic disorders.
 - c) Autosomal aberrations-Down syndrome. Patau, Edward and Cri-du-chant 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 histrological and biological perspective. Race and racism, biological basis of morphological variation of non-metric and metric characters. Racial criteria, racial trails 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 gentic marker-ABO, Rh blood groups, HLA, Hp, transfenn. 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. Re-sources-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 so cio economic.
Ageing and senescence. Theories and observations-biological and chronological longevity. Human physique and somatotypes. 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 monarche, 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, duel 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 cylogenetics in re-productive biology.
- 13.10 Application of statistical principles in human genetics and Physical Anthropology.

PAPER II

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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.
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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.
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**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-Lame's equations

STRUCTURAL ANALYSIS:

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

Rolling loads and influences lines. Influences lines for Shear Force and Bending moment at a section of beam. Criteria for maximum shear force and bending moment in beams traversed by a system of moving loads. Influences lines for simply supported plane pin jointed trusses.

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

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

Plastic Analysis of beams and frames : Theory of plastic bending, plastic analysis, statical method, Mechanism method.

Unsymmetrical bending : Moment of inertia, product of inertia, position of Neutral Axis and Principle axes, calculation of bending stresses.

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PART-B : DESIGN OF STRUCTURES: STEEL, CONCRETE AND MASONRY STRUCTURES. STRUCTURAL STEEL DESIGN:

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

DESIGN OF CONCRETE AND MASONRY STRUCTURES :

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, flownet, methods of drawing flownet, sources and sinks. flow separation, free and forced vortices.

Control volume equation, continuity, momentum, energy and moment of momentum equations from control volume equation. Navier-Stokes equation. Euler's equation of motion, application of 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 sublayer, 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, 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.

(C) 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 test.

Earth pressure at rest, active and passive pressure. Rankine's theory : Coulomb's wedge theory. Earth pressure on retaining wall, sheet pile 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 metre tests.

Essential features of foundation, types 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.

PAPER - II

Part -A : CONSTRUCTION TECHNOLOGY, EQUIPMENT, PLANNING AND MANAGEMENT

1. Construction Technology :

Engineering Materials :

Physical properties of construction materials : Stones, bricks and tiles, lime, cement and surkhi mortars, Lime Concrete and Cement Concrete. Properties of freshly mixed and hardened concrete. Flooring tiles, use of ferro-cement, fibre-reinforced and polymer concrete, high strength concrete and light weight concrete. Timber : Properties and uses; defects in timber, seasoning and preservation of timber. Plastic, Rubber and damp proofing materials, termite proofing, Materials, for low cost building.

CONSTRUCTION :

Building components and their functions, brick masonry : Bonds, jointing Stone masonry. Design of Brick masonry walls as per I.S. codes, factors of safety, serviceability and strength requirements, plastering, pointing. Types of Floors & Roofs. Ventilators, Repairs in buildings.

Functional planning of building : Building orientation, circulation, grouping of areas, privacy concept and design of energy efficient building, provisions of National Building Code.

Building estimates and specifications; Cost of works; valuation.

2. CONSTRUCTION EQUIPMENT:

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

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

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

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

Nowwork analysis : CPM and PERT analysis, Float Times, cashing of activities, contraction of network for cost optimization, up dating, Cost analysis and resource allocation.

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

Part-B : SURVEY AND TRANSPORTATION ENGINEERING

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

Railways : Permanent way, sleepers, rail fastenings, ballast, points and crossings, design of turnouts, stations and yards, turn-tables, signals, and interlocking; level-crossing. Construction and maintenance of permanent ways : Super elevation, croop of rail, ruling gradlent, track 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, high-way capacity. Channelised and unchannelised intersections, rotary design elements, markings sign, signals, street lighting, Traffic surveys. Principle of high-way financing.

Part – C : HYDROLOGY, WATER RESOURCES ANG 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 equifers, aquifers, aquitards, radial flow into a well under confined and unconfined conditions, tube wells, pumping and recuperation tests, ground water potential.

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

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

Canals : Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most efficient section, lined canals, their design, regime theory, critical shear stress, bed load, local and suspended load transport, cost analysis of lined and 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 & earth dams stability analysis, foundation treatment, joints & galleries, control of sea page.

Spillways : Spillway types, crest gators, energy dissipation.

River training : Objectives of river training, methods of river training.

PART-D : ENVIRONMENTAL ENGINEERING :

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

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

Water storage and distribution : storage and balancing reservoirs : types, location and capacity.

Distribution system : layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations.

Sewerage systems : Domestic and industrial wastes, storm sewage-separate and combined systems, flow through sewers, design of sewers, sewer appurtenances manholes, 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 fillers, oxidation ponds, activated sludge process, septic tank, disposal of sludge, recycling of waste water.

Solid waste : collection and disposal in rural and urban context's 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 1

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 net-works, driving point and transfer functions; poles and zeros of network functions. Elements of networks synthesis. Fitter-theory : design and applications. Active fitters, 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 Processing of analog signals through discrete-time systems.

E.M.Theory

Maxwell's equations, wave propagation in bounded media. Boundary conditions, reflection and refraction of plane waves. Transmission line : Distributed parameters circuits, traveling and standing waves, impedance matching, Smith chart. Waveguides : parallel plane guide, TE, TM and TEM waves, rectangular and cylindrical waves guides, resonators. 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 circuits : Filters, smuso da oscillators : criterion for oscillation, single transistor and OPAMP configurations. Function generators and wave-shaping circuits.

Power supplies.

Digital Electronics

Boolean algebra; minimization 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 times, 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 transformers. 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, Deemphasis, Preemphasis. CW modulation system : Superhetrodyne receivers, AM receivers, communication 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 propagation. Extraterrestrial communications. Antenna; Various types, gain, resistance, band-width, beamwidth 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.

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, Advanced 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-analyzer, 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 wafer cleaning, photo-li-thography, wet and dry etching, oxidation, diffusion, ion-implantation, CVD and LPCVD techniques for deposition of poly-silicon, 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 components, analysis of 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 generators, tie-line control, frequency control. 'Economic dispatch.

Power system protection

Principles of overcurrent, 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 (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 over-view 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 1**

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, Bolts 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 an isotropy, 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-Graphical and Simplex methods. Transportation and assignment models. Single server queuing model.

Value Engineering : Value analysis for cost/value. Total quality management and forecasting techniques. Project management.

6. ELEMENTS OF COMPUTATION :

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

PAPER – II

1. THERMODYNAMICS :

Basic concept. 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 gases 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 modeling. 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 distributions, stochastic Independence of events and of random variables, expectation and moments of a random variable, conditional expectation, convergence of a sequence of random variable in distribution, in probability, in p -th mean and almost everywhere, their criteria and inter-relations, Borel-Centelli lemma, Chebyshev's and Khinchine's weak laws of large numbers, strong law of large numbers and Kolmogorov's theorems, Glivenko-Centelli 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 and its large sample proportion, 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, multiple regression, multiple and partial correlations, regression diagnostics and sensitivity analysis, calibration problems, estimation of variance and covariance components, MINQUE theory, multivariate normal distribution, Mahalanobis D^2 and Hotelling's T^2 statistics and their applications and properties, discriminant analysis, canonical correlations, one-way MANOVA, principal component analysis, elements of factor analysis.

Sampling Theory and Design of Experiments

An outline of fixed-population and super-population approaches, distinctive features of finite population sampling, probability sampling designs, simple random sampling with and without replacement, stratified random sampling, systematic sampling and its efficacy for structural populations, cluster sampling, two-stage and multi-stage sampling, ratio and regression, methods of estimation involving one or more auxiliary variables, two-phase sampling, probability proportional to size sampling with and without replacement, the Hansen-Hurwitz and the Horvitz-Thompson estimators, non-negative variance estimation with reference to the Horvitz-Thompson estimator, 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; 2^n , 3^4 and 3^3 confounding in factorial experiments, split-plot and simple lattice designs.

PAPER II

I. Industrial Statistics

Process and product control, general theory of control charts, different types of control charts for variables and attributes, \bar{X} , R , s , p , np and c charts, cumulative sum chart, V-mask, 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 queueing 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 Economic and Official Statistics

Determination of trend, seasonal and cyclical components, Box-Jenkins method, tests for stationarity 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 number, index numbers 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, Zelinier'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-state 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 quasistable 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.

- (i) "Scheduled Tribes" means such tribes as are specified by the President of India under third Schedules to the State of Mizoram Act 1986 (Central Act No. 34 of 1986);
- (j) "Service" means the Mizoram Finance and Accounts Service;
- (k) "State" means the State of Mizoram;
- (l) "Year" means Twelve Months.

PART - II CONSTITUTION OF THE SERVICE AND ITS CLASSIFICATION

3. CONSTITUTION OF THE SERVICE :

On the commencement of these Rules, there shall be constituted a service to be known as the Mizoram Finance and Accounts Service.

The Service shall consist of the following persons, namely :-

- (a) all persons already appointed to the existing posts as mentioned in Schedule-I appended to these Rules, in accordance with the Mizoram (Finance and Accounts Service) Rules, 1991
- (b) all persons to be appointed to the Service in accordance with these Rules, after the commencement of these Rules.

4. COMPOSITION AND STRENGTH OF SERVICE :

- (1) The composition and strength of the service and nature of post there-in shall be as may be determined by the Government from time to time.
- (2) At the commencement of these Rules, the composition and strength of the Service and the nature of posts therein shall be as shown in Schedule-II

5. CLASSIFICATION :

- (1) The service shall have six grades, namely :-
 - (a) Supertime Grade 'A'
 - (b) Supertime Grade 'B'
 - (c) Selection Grade
 - (d) Junior Administrative Grade
 - (e) Senior Grade
 - (f) Junior Grade
- (2) All the posts in the Service shall be Mizoram Finance and Accounts Service (Group A) Gazetted posts.

PART - III RECRUITMENT TO THE SERVICE

6. Method of Recruitment :

Recruitment to the service after the commencement of these rules shall be by the following methods, namely :-

- (a) 50% of the substantive posts in the Junior Grade shall be filled by LDE in a manner specified in Part-V of these rules from amongst those substantively holding the post of Auditors, Divisional Accountants, Treasury Accountants under Finance Department and Superintendents of Accounts in the Department of Food, Civil Supplies & Consumer Affairs and Transport Department under the Government of Mizoram.

- (b) 25% of the substantive posts shall be filled by promotion through selection method from amongst those substantively holding not less than five years the post of Auditors, Divisional Accountants, Treasury Accountants under Finance Department and Superintendents of Accounts in the Department of Food, Civil Supplies & Consumer Affairs and Transport Department under the Government of Mizoram.
- (c) The remaining 25% of the substantive posts in the Junior Grade shall be filled by direct recruitment through a competitive examination in the manner specified in Part-IV of these rules.
- (d) 8 (eight) posts of Sub-Treasury Officer upgraded and absorbed in to the Mizoram Finance & Accounts Service vide Government Notification No.A.1 1015/1/87-F.Est. dt. 17.5.2006 and No.A.1 1015/1/87-F.Est/Pt dt.3.10.2007 shall be encadred in the Junior Grade of Mizoram Finance & Accounts Service with effect from 17.5.2006.

PART-IV DIRECT RECRUITMENT AND APPOINTMENT

7. COMPETITIVE EXAMINATION

- (1) Save as provided in rules 6 and 14, appointment to the service as direct recruitment against 25% of the substantive posts in the Junior Grade of the service shall be only through competitive examination in the manner specified in these rules.
- (2) A competitive examination for direct recruitment to the service shall be held at such intervals as the Government may, in consultation with the Commission, determine from time to time. The dates on which and the places at which the examination shall be held may be fixed by the Commission.
- (3) The Commission shall prepare a list of successful candidates who appeared in the examination in order of merit and shall send the list to the Government.
- (4) The examination shall be in accordance with the rules and syllabus as per Schedule III-A.

8. PROCEDURE OF DIRECT RECRUITMENT :

A candidate for direct recruitment to the service must satisfy the following conditions, namely :-

- (a) He must be a citizen of India.
- (b) He must have attained the age of 18 years, but must not have exceeded the age of 35 years on the first day of the year of advertisement :
Provided that the upper age limit may be relaxed by 5 years in the case of candidates belonging to Scheduled Castes and Scheduled Tribes and in respect of candidates belonging to special categories in accordance with any general or special order issued by the Government from time to time.
- (d) He must hold a degree of any University recognised by the Central/State Government.

9. APPOINTMENT OF DIRECT RECRUIT :

- (i) Subject to the provisions of these rules, appointment to the Service shall be made from the candidates included in the list referred to in Rules 7(3) of these rules strictly in the order of merit and with due regard to the ratio specified in Rule 6(a),6(b) and 6(c) of these rules.
- (ii) A person appointed to the Service shall join within 45 days from the date of receipt of the order of appointment, failing which and unless the Governor is otherwise pleased to extend the period, merit seniority will lapse and the appointment shall be liable to cancellation.

PART - V - RECRUITMENT BY LIMITED DEPARTMENTAL EXAMINATION

10. RECRUITMENT BY LIMITED DEPARTMENTAL EXAMINATION :

- (1) Save as provided in rules 6 & 13, appointment to the service against 50% of the substantive posts in the Junior Grade of the service shall be made through a limited departmental examination in the manner specified herein below.
- (2) A limited departmental examination for selection to Junior Grade of the Service shall be held by the Commission at such intervals as the Governor may, in consultation with the Commission, determine from time to time.
- (3) The examination shall be in accordance with the rules and syllabus as per Schedule III-B of these rules.

11. PROCEDURE OF SELECTION

- (1) The procedure of selection through LDE shall be as laid down below:-
Incumbents of the posts mentioned in rule 6(a), who have put in not less than 5 years regular service in their respective grades shall be eligible to appear at the Limited Departmental Examination irrespective of their length of service in their respective grades.
- (2) The decision of the Commission as to the eligibility or otherwise of a candidate for admission to the examination shall be final, and a candidate to whom a Certificate or Admission Card has not been issued by the Commission shall not be admitted to the examination.
- (3) The Commission shall prepare and forward to the Government a list of candidates arranged in order of merit of candidates who have qualified in the examination.
- (4) The list of successful candidates shall ordinarily remain valid for one year from the date of recommendation.

12. APPOINTMENT BY SELECTION :

All appointment to the service by way of selection in the manner specified herein before, shall be made from the candidates in the list referred to in sub-rule(3) of rule 11 of these rules in order of merit and strictly to the extent specified in rule 6(a) of these rules.

13. INITIAL APPOINTMENT TO THE SERVICE :

Notwithstanding anything contained in these rules, the Governor may, at the commencement of these rules, appoint any person to the service in the appropriate grade, who, at such commencement, holds any of the posts specified in Schedule-II.

EXPLANATION : For the purpose of these rules, a person who would have held a post mentioned in Schedules II but for his being on leave, deputation or on Foreign Service or for his temporary or officiating appointment to an equivalent or higher posts, shall be deemed to be holding such a post.

PART-VI-APPOINTMENT, PROBATION, TRAINING AND CONFIRMATION

14. APPOINTMENT :

- (1) All appointments to the service shall be made in the appropriate grades of the service and not against any specific post of the service.
- (2) All appointments to the service shall be made by the Governor and shall be notified in the Official Gazette.

15. DISQUALIFICATION :

- (i) No person -
 - (a) who has entered into or contracted a marriage with a person having a spouse living or
 - (b) who, having a spouse living, has entered into or contracted a marriage with any person shall be eligible for appointment to the service. Provided that the Governor may, if satisfied that such marriage is permissible under the personal law applicable to such persons and the other party to the marriage and that there are other grounds for so doing, exempt any person from the operation of these rules.
- (ii) A person who is already in government service or in the service of a statutory body shall not be appointed unless a release Certificate or a 'No objection Certificate' from that government statutory body, as the case may be, is furnished.

16. PROBATION :

- (i) Every person recruited to the service in accordance with these rules shall be on probation for a period of two years;

Provided that the period of probation may, for good and sufficient reasons to be recorded in writing, be extended by the Governor in the individual cases.

- (ii) A person on probation shall be liable to be discharged from the service at any time without assigning any reason thereof during the period of probation;

Provided that if such a person on probation holds a lien on any permanent post under the Central Government or the State Government or Administration of Union Territory, he shall be reverted to that post;

Provided further that a person who holds a lien to any permanent post under the Central Government or the State Government or Administration of Union Territory may, if he so desires, during the period of probation have the option to revert back to his parent department after giving 3 months notice.

17. TRAINING :

Every probationer shall, during the period of probation, undergo such training as the Governor may, from time to time, prescribe;

Provided that the Governor may, if satisfied that there are special grounds for so doing, exempt a probationary from the operation of this rule.

NOTE :- In case of persons appointed prior to the commencement of these rules and whose services were regularised by the government without training during the probation period, they shall be treated as exempted from the operation of this rule.

18. DEPARTMENTAL EXAMINATION :

Every probationer shall, during the period of probation, appear at and pass such departmental examination as may be prescribed and conducted by the Commission or the Board as the case may be;

Provided that the Governor may, for good and sufficient reasons, temporarily exempt a probationer from appearing and passing any one or more of the prescribed departmental examination.

NOTE :- The existing incumbents of all categories of post included in the initial constitution whose services were regularised by the government without departmental examination shall be exempted from appearing and passing the departmental examination.

19. CONFIRMATION :

A member who has been declared to have satisfactorily completed the period of probation shall be confirmed in the Service.

PART - VII MISCELLANEOUS PROVISION

20 TIME SCALE OF PAY :

The time scale of pay admissible to the service shall be as follows, subject to revision by the Government from time to time.

(a) SUPERTIME GRADE 'A'	: Rs. 16400-450-20900/- +1000 S.A
(b) SUPERTIME GRADE 'B'	: Rs. 16400-450-20900/-
(c) SELECTION GRADE	: Rs. 14300-400-18300/- +750 S.A.
(d) JUNIOR ADMINISTRATIVE GRADE	: Rs. 14300-400-18300/-
(e) SENIOR GRADE	: Rs. 12000-375-16500/-
(f) JUNIOR GRADE:	: Rs. 8000-275-13500/-

21. FIXATION OF INITIAL PAY :

- (1) On first appointment to the services, the initial pay of member of the service shall be fixed at the minimum of the time scale unless under the Fundamental Rules and Subsidiary Rules or any other Rules governing the fixation of pay for the time being in force, he is entitled to have his pay fixed at the higher stage in that time scale.
- (2) On promotion/appointment of a member from lower to higher grade in the Service, the initial pay in the time scale shall be fixed in accordance with the principles governing such fixation under the Fundamental Rules and Subsidiary Rules or any other rules governing the fixation of pay in force from time to time.

22. INCREMENT :

- (1) the first increment due to a member in the time scale of pay shall accrue on the expiry of successful completion of the period of probation.
- (2) The Governor may withhold, for such time as he may direct, an increment or increments due to a substantive member of the service who has failed to pass the departmental examination within such time as the Governor may, by general order, prescribe; but withholding of such increments shall have no cumulative effect.

23 PROMOTION TO HIGHER GRADE :

- (1) Subject to the provision of the sub-rule 2,3 and 4 below, appointments of the members of the service to the Senior Grade, the Junior Administrative Grade, the Selection Grade,

Supertime Grade 'B' and Supertime Grade 'A' shall be made in consultation with the Commission on the basis of seniority with due regard to merit.

- (2) A member of the Service in the Junior Grade shall be eligible for promotion to the Senior Grade after he has rendered regular service in the Junior Grade for a minimum period of 5 years subject to rule 18.
- (3) A member of the Service in the Senior Grade shall be eligible for promotion to the Junior Administrative Grade after he has put in a minimum period of 5 years in the Senior Grade or not less than 10 years service counted from the date of entry into Junior Grade out of which he should have rendered regular service of at least 3 years in the Senior Grade.
- (4) A member of the Service in the Junior Administrative Grade shall be eligible for promotion to the Selection Grade after he has served in the Junior Administrative Grade for a minimum period of 5 years or not less than 18 years of service counted from the date of entry into Junior Grade out of which he should have rendered regular service of at least 2 years in Junior Administrative Grade.
- (5) A member of the Service in the Selection Grade shall be eligible for promotion to the Supertime Grade 'B' after he has served in the selection Grade for a minimum period of 5 years or not less than 20 years of service counted from the date of entry in Junior Grade out of which he should have rendered regular service of at least one year in Selection Grade.
- (6) A member of the Service in the Supertime Grade 'B' shall be eligible for promotion to the Supertime Grade "A" from the date subsequent to the date from which he has rendered service in Supertime Grade 'B' irrespective of whatever length of service he has rendered in Supertime Grade B.

24. POSTING OF MEMBER OF THE SERVICE

Every member of the Service shall, unless he is appointed to an ex-cadre post, or is otherwise not available for holding a duty post owing to the exigencies of public services, be posted against a duty post under the Government.

25. SENIORITY :

- (i) The seniority inter-se of the members of the service at its initial constitution shall be as determined by Government in accordance with the orders and instructions in force before the commencement of these Rules.
- (ii) The seniority inter-se of the members of service appointed after the commencement of these rules shall be determined by the Government from time to time in accordance with principles/rules for determination as may be made by the Government.

26. OTHER PROVISIONS RELATING TO CONDITION OF SERVICE :

Except as provided in these rules, all matters relating to pay, allowances, leave, pension, discipline and other conditions of service shall be regulated by the general rules framed by the Government from time to time.

27. RELAXATION :

Where the Governor is satisfied that the operation of any of these rules causes undue hardship in any particular case, he may dispense with or relax that rule to such extent and subject to such

conditions as he may consider necessary for dealing with the case in a just and equitable manner in consultation with the Commission.

Provided that the case of any person shall not be dealt with in any manner less favourable to him than that provided by any of these rules.

28. INTERPRETATION :

If any question arises relating to the interpretation of these rules, it shall be referred to the Governor whose decision thereon shall be final.

29. REPEAL AND SAVING :

- (1) On and from the commencement of these rules, the Mizoram Finance and Accounts Service Rules, 1991 issued under Notification No.A. 12018/1/85-P&AR(C) dated 8.5.91 and published in the Mizoram Gazette Issue No 93 dated 10.5.1991 and its amendments issued under Notification No.A.12018/1/85-P&AR(GS) dated 23.5.1997, and published in the Mizoram Gazette Issue No.159 dated 6.6.1997, Notification No.A.12018/1/85-P&AR(GSW) dated 31.7.1997, published in the Mizoram Gazette Issue No.261 dated 6.8.1997, addendum issued under No.A.12018/1/85-P&AR(GSW) dated 18.9.1997 and published in the Mizoram Gazette Issue No.336 dated 30.9.1997 and Notification No.A.12018/1/85-P&AR(GSW) dated 20.4.2001 and published in the Mizoram Gazette Issue No.78 dated 24.4.2001 shall stand repealed.
- (2) Notwithstanding such repeal, any order made or action taken under any of the rules so repealed or under any general orders ancillary thereto shall be deemed to have been validly made or taken under the corresponding provisions of these rules.

By order and in the name of the Governor of Mizoram



(C. LALCHHUANA)

Addl. Secretary to the Govt. of Mizoram,
Deptt. of Personnel & Administrative Reforms.

**SCHEDULE - I
RULE - 3(a)**

**THE AUTHORISED PERMANENT STRENGTH OF THE SERVICE AND PARTICULAR
OF THE POSTS INCLUDED IN THE SERVICE RULES**

		<u>No. of Posts</u>
1.	Specified posts under Government of Mizoram	69
2.	Deputation, Training and Leave Reserves	<u>20.7</u>
		89.7
	SAY	90
A.	SUPERTIME GRADE 'A':	
1.	Secretary	1
	Total A	1
B.	SUPERTIME GRADE 'B':	
1.	Additional Secretary	2
	Total B	2
C.	SELECTION GRADE :	
1.	Joint Secretary, Finance Department	1
2.	Director, Accounts & Treasuries	1
3.	Director, Institutional Finance & State Lotteries	1
	Total C	3
D.	JUNIOR ADMINISTRATIVE GRADE :	
1.	Deputy Secretary (Budget), Finance Department	1
2.	Deputy Secretary (Accounts), Finance Department	1
3.	Joint Director of Accounts & Treasuries	2
4.	Joint Director, Institutional Finance & State Lotteries	1
	Total D	5
E.	SENIOR GRADE :	
1.	Under Secretary, (Accounts) Finance Department	1
2.	Deputy Examiner of Local Accounts	1
3.	Deputy Director of Accounts & Treasuries	3
4.	Deputy Director, Institutional Finance & State Lotteries	1
5.	Deputy Director of Accounts in Administrative Training Institute	1
6.	Deputy Director of Accounts in Public Works Department	1
7.	Deputy Director of Accounts in Power & Electricity Department.	1
8.	Deputy Director of Accounts in Rural Development Department	1
9.	Deputy Director of Accounts in Food, Civil Supplies & Consumer Affairs	1
10.	Deputy Director of Accounts in Police Department	1
11.	Deputy Director of Accounts in School Education Department	1
	Total E	13

F. JUNIOR GRADE :-

1.	Treasury Officer, Aizawl South	1
2.	Treasury Officer, Aizawl North	1
3.	Treasury Officer, Lunglei	1
4.	Treasury Officer, Saiha	1
5.	Treasury Officer, Champhai	1
6.	Treasury Officer, Kolasib	1
7.	Treasury Officer, Serchhip	1
8.	Treasury Officer, Mamit	1
9.	Treasury Officer, Lawngtlai	1
10.	Treasury Officer, Tlabung	1
11.	Treasury Officer, Chawngte	1
12.	Treasury Officer, Aizawl	1
13.	Assistant Examiner of Local Accounts	1
14.	Assistant Director of Accounts & Treasuries	5
15.	Assistant Director of Institutional Finance & State Lotteries	2
16.	Finance & Accounts Officer in Public Works Department	3
17.	Finance & Accounts Officer in Higher & Technical Education	1
18.	Finance & Accounts Officer in AH & Vety.	1
19.	Finance & Accounts Officer in Health & Family Welfare	1
20.	Finance & Accounts Officer in Industries	1
21.	Finance & Accounts Officer in Soil & Water Conservation	1
22.	Finance & Accounts Officer in Environment & Forests	1
23.	Finance & Accounts Officer in Agriculture	1
24.	Finance & Accounts Officer in Printing & Stationery	1
25.	Finance & Accounts Officer in Rural Development	1
26.	Finance & Accounts Officer in Public Health Engineering	1
27.	Finance & Accounts Officer in Trade & Commerce	1
28.	Finance & Accounts Officer in Geology & Mining	1
29.	Finance & Accounts Officer in Mizoram Public Service Commission	1
30.	Finance & Accounts Officer in Local Administration Department	1
31.	Finance & Accounts Officer in Land Revenue & Settlement	1
32.	Finance & Accounts Officer in Power & Electricity	2
33.	Finance & Accounts Officer in Transport	1
34.	Finance & Accounts Officer in Food, Civil Supplies & Consumer Affairs	1
35.	Finance & Accounts Officer in Urban Development & Poverty Alleviation	1
36.	Finance & Accounts Officer in Disaster Management & Rehabilitation	1
37.	Finance & Accounts Officer in Hospital & Medical Education	1

Total of F 45**G. TOTAL OF A+B+C+D+E+F = 1+2+3+5+13+45 = 69****H. RESERVATION**

a)	Deputation	@	10% of 69	6.9
b)	Training	@	10% of 69	6.9
c)	Leave	@	10% of 69	6.9

Total of H 20.7 = 21

GRANT TOTAL OF G & H = 69+21 = 90
SAY = 90

**SCHEDULE-II
RULE-4(2)**

LIST OF EXISTING POSTS AND BREAK-UP TO INITIALLY COMPOSE THE SERVICE

	No. of posts
1. Secretary	1
2. Additional Secretary	2
3. Joint Secretary	1
4. Director, Accounts & Treasuries	1
5. Director, Institutional Finance & State Lotteries	1
6. Deputy Secretary (Budget), Finance Department	1
7. Deputy Secretary (Accounts), Finance Department	1
8. Joint Director, Accounts & Treasuries	2
9. Joint Director, Institutional Finance & State Lotteries	1
10. Under Secretary, (Accounts) Finance Department	1
11. Deputy Examiner of Local Accounts	1
12. Deputy Director of Accounts & Treasuries	3
13. Deputy Director, Institutional Finance & State Lotteries	1
14. Deputy Director of Accounts in Administrative Training Institute	1
15. Deputy Director of Accounts in Public Works Department	1
16. Deputy Director of Accounts in Power & Electricity Department.	1
17. Deputy Director of Accounts in Rural Development Department	1
18. Deputy Director of Accounts in Food, Civil Supplies & Consumer Affairs	1
19. Deputy Director of Accounts in Police Department	1
20. Deputy Director of Accounts in School Education Department	1
21. Treasury Officer, Aizawl South	1
22. Treasury Officer, Aizawl North	1
23. Treasury Officer, Lunglei	1
24. Treasury Officer, Saiha	1
25. Treasury Officer, Champhai	1
26. Treasury Officer, Kolasib	1
27. Treasury Officer, Serchhip	1
28. Treasury Officer, Mamit	1
29. Treasury Officer, Lawngtlai	1
30. Treasury Officer, Tlabung	1
31. Treasury Officer, Chawngte	1
32. Treasury Officer, Aizawl	1
33. Assistant Examiner of Local Accounts	1
34. Assistant Director of Accounts & Treasuries	5
35. Assistant Director of Institutional Finance & State lotteries	2
36. Finance & Accounts Officer in Public Works Department	3
37. Finance & Accounts Officer in Higher & Technical Education	1
38. Finance & Accounts Officer in AH & Vety.	1
39. Finance & Accounts Officer in Health & Family Welfare	1
40. Finance & Accounts Officer in Industries	1
41. Finance & Accounts Officer in Soil & Water Conservation	1
42. Finance & Accounts Officer in Environment & Forests	1
43. Finance & Accounts Officer in Agriculture	1
44. Finance & Accounts Officer in Printing & Stationery	1
45. Finance & Accounts Officer in Rural Development	1
46. Finance & Accounts Officer in Public Health Engineering	1
47. Finance & Accounts Officer in Trade & Commerce	1
48. Finance & Accounts Officer in Geology & Mining	1
49. Finance & Accounts Officer in Mizoram Public Service Commission	1
50. Finance & Accounts Officer in Local Administration Department	1
51. Finance & Accounts Officer in Land Revenue & Settlement	1
52. Finance & Accounts Officer in Power & Electricity	2
53. Finance & Accounts Officer in Transport	1
54. Finance & Accounts Officer in Food, Civil Supplies & Consumer Affairs	1
55. Finance & Accounts Officer in Urban Development & Poverty Alleviation	1
56. Finance & Accounts Officer in Disaster Management & Rehabilitation	1
57. Finance & Accounts Officer in Hospital & Medical Education	1
Total	69

SCHEDULE - III - A
(See Rule 8(4))

**SYLLABUS FOR COMPETITIVE EXAMINATION FOR DIRECT RECRUITMENT TO
JUNIOR GRADE OF MIZORAM FINANCE AND ACCOUNTS SERVICE**

Sl. No.	Subject	Time	Full Marks
1.	General Studies (Paper I and II) Details as shown in Annexure - I		
	(a) Paper - I	3 Hrs.	100
	(b) Paper - II	3 Hrs.	100
2.	General English (including Drafting and Precis Writing)	3 Hrs.	100
3.	Two Optional Subject (Paper I and II each) on any of the following subjects offered at Degree level examinations of a recognised University.		
	(a) Paper - I	3 Hrs	100
	(b) Paper - II	3 Hrs.	100

OPTIONAL SUBJECTS (PAPER I AND II EACH)

- (i) Botany
 - (ii) Chemistry
 - (iii) Commerce and Accountancy
 - (iv) Economic
 - (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 and International Relations
 - (xviii) Psychology
 - (xix) Public Administration
 - (xx) Zoology
 - (xxi) Sociology
 - (xxii) Anthropology
 - (xxiii) Agriculture
 - (xxiv) Civil Engineering
 - (xxv) Electrical Engineering
 - (xxvi) Mechanical Engineering
 - (xxvii) Statistics
- Syllabus for Optional Subjects are as in the Annexure - II

4. Notwithstanding anything contained in this Schedule a candidate shall not be allowed to offer the following combinations of subject, namely :-
- Political Science and International Relations and Public Administration.
 - Education and Psychology.
5. VIVA - VOCE 50
(in respect of candidates, who qualified in the written examination)

ANNEXURE - I
DETAILS OF GENERAL STUDIES

General Studies Paper-I and Paper-II will cover the following areas of knowledge :-

PAPER - I

- Modern History of India and Indian Culture.
- Cultural heritage of Mizoram.
- Current events of National and Inter-national importance.
- Statistical analysis, graphs and diagrams.

PAPER - II

- Indian Polity
- Indian economy and Geography of India including Geography of Mizoram and
- 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 age of the nineteenth century and would also include question on Gandhi, Tagore and Nehru. Cultural heritage of Mizoram will cover subject on Mizo Sakhua, Mizo Kut leh Lam, Thangchhuah, important historical places and heroes, traditional practices and life styles, Mizo Lalte leh Khua leh tui-in awp dan. The part relating to statistical analysis, graphs and diagrams will include exercise to test the candidate's ability to draw common sense conclusion from information presented in statistical, graphical and diagrammatical form and to point out deficiencies, limitations or inconsistencies therein.

In Paper - II

The part relating to Indian Polity will include question on the political system in India. In the part pertaining to the Indian Economy and Geography of India, including Geography of Mizoram, question will be put on planning in India and the physical economy 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.

SCHEDULE - III - B
(See Rule 11(3))

**SYLLABUS FOR LIMITED DEPARTMENTAL EXAMINATION FOR RECRUITMENT
TO JUNIOR GRADE OF MIZORAM FINANCE & ACCOUNTS SERVICE**

Sl. No.	Subject	Time	Full Marks
1.	Drafting Precis Writing	3 hrs.	150
2.	ACCOUNTS PAPER - THEORY (FR & SR, CTR, GFR, Account Code Vol-I, Public Works Accounts, Pension)	3 hrs.	150
3.	ACCOUNTS PAPER-PRACTICAL (FR & SR, CTR, GFR, Account Code Vol-I, Public Works Accounts, Pension)	3 hrs.	150

ANNEXURE - II

**SYLLABUS FOR OPTIONAL SUBJECTS SPECIFIED IN SCHEDULE-III OF THE MIZORAM
FINANCE AND ACCOUNTS SERVICE (SECOND AMENDMENT) RULES, 1997.**

**OPTIONAL SUBJECTS
BOTANY**

PAPER - I

1. Microbiology, Viruses, bacteria, plasmids - structure and reproduction, General account of infection and immunology, Microbes in agriculture, industry and medicine and air, soil and water. Control of pollution using micro-organisms.
2. Pathology : Important plant 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 of 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, polyembryony. Polynology and its applications. Comparison of systems of classification of angiosperms. Modern trends in biosystematics, Taxonomic and economic importance of Cycadaceae, Pinaceae. Gnetaceae, Magnoliaceae, Ranunculaceae, Cruciferae, Rosaceae, Leguminosae, Euphorbiaceae, Malvaceae, Dipterocarpaceae, Umbelliferae, Asclepiaceae Verbanaceae, Solanaceae, Rubiaceae, cucurbitaceae composite, Gramineae, Plume, 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.

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 sexlinked inheritance. Male sterility its significance in land breeding. Cytoplasmic inheritance. Elements of human genetics. Standard deviation and Chi-square analysis genetics engineering. Organ evolution evidence mechanism and theories.
 3. Physiology and Biochemistry : Detailed study of water relations. Mineral nutrition and iron/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 applications in agri-horticulture. Agrochemicals. Stress physiology Vernalization Fruit and seed physiology-dormancy, storage and germination of seed. Perthenocarphy fruit ripening.
 4. Ecology : Ecological factors. Concept and dynamics of community, succession. Concept of biospheres. Conservation of ecosystems. Pollution and its control. Forest types of India. Afforestation, deforestation and social forestry. Endangered plants.
 5. 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 and chemical bonding : Quantum theory, Heisenberg's uncertainty principle, Schrodinger wave equation (time independent). Interpretation of the wave function, particle in a one-dimensional box, quantum numbers, hydrogen atom wave functions, Shapes of s.p. and 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 and resonance energy. Electronic configuration of H_2 , H_2 , N_2 , O_2 , F_2 , NO , CO and HF molecules in terms of molecular orbital approach. Sigma and pi bonds. Bond order, bond strength and 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-Helmholz equation. Chemical potential. Thermodynamics 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 faces, lattice 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. Chemical kinetics : Order and molecularity of a reaction. Rate of equations (differential and 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 polymerisation and photo chemical reactions.
5. Electrochemistry : Limitations of Atthenius theory of dissociation. Debye-Huckel theory of strong electrolytes and its quantitative treatment. Electrolytic conductance theory and theory of activity co-efficients. Derivation of limiting laws of various equilibria and transport properties of electrolyte solutions.
6. Concentration cells, liquid junction potential, application of e.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, Crystalfield Theory and its modifications, applications of the theories in the explanation of magnetism and electronic spectra of metal complexes.
 - (b) Metal Carbonyles : 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 special properties.
10. Reactions in non-aqueous solvents (liquid ammonia and sulphur dioxide)

PAPER - II

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

Formation and stability of reactive intermediates (carbocations, carbonions free radicals, carbenes, nitrenes and benzyne).

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, Cannizzro 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 reactions, Reformatsky reaction, pinacol-pinacolone, Wagner-Meer-Wein and Beckmann rearrangements, and their mechanisms-uses of the following reagents in organic synthesis : OsO_4 , NBS , diborane, Na -liquid ammonia NaBH_4 LiAlH_4 .

5. Photochemical reactions of organic, and inorganic compounds : Types and of reactions examples and synthetic uses-methods used in structure determination, Principles and application of UV-visible, IR, ^1H 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 diatomic linear symmetric, linear asymmetric 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, $\alpha\beta$ 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 as a 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-Accounting of holding 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-jobs 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 and variance analysis-Responsibility accounting-basis 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 and optional capital structure-Weighted average cost of capital and the controversy surrounding the Modigliani and Miller model, Sources of rising short-term intermediate and longterm finance role of public and convertible debentures-Norms and guidelines regarding debt-equity ratios Determinants of an optional dividend policy-optimising models of James En. Walter and John Liner, forms of dividend payment structure of working capital and the variable affecting the level of difference of components-Cashflow 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 efficiencies of India Money Market structure of assets and liabilities of Commercial Banks-Achievements and failures of Nationalisation-Regional Rural Bank-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.

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 organisation-functions and limitations.

Evolution or organisation theory :

Classical, Neo-classical and system approach-Bureaucracy, Nature and basis of power, sources of power, power structure and politics-Organisational behaviours as a dynamic system : technical, social and power systems-inter-relations and interactions-Perception-Status system. Theoretical and empirical foundation of Maslow, Mc Gregor, Herzberg, Likert, Vroom, Porter and Lowler, Adam - Homan's Model of motivation. Morale and productivity-Leadership : Theories and styles-Management of conflicts in organisation - Transactional Analysis Significance of culture to organisations, 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 out-side leadership-Workers education and other problems-Collective bargaining-approaches conditions, Limitation and its effectiveness in Indian conditions-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 turnover 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 organisation-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, Macro 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. The rate of exchange. The balance of payment. International monetary and banking institutions.

ECONOMICS

PAPER II

1. The Indian Economy : Guiding principles of Indian economy 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 and regional distribution. Extent and incidence of poverty.
2. Agricultural Production : Agricultural Policy : Land Reforms, Technological change. Relationship with the Industrial sector.
3. Industrial Production : Industrial Policy : Public and private sectors. 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. Education 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 Creativity :
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 modernisation; 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; Type and Trait approaches to personality; Techniques of personality assessment; Adjustment Mechanisms, Role of Guidance and Councelling in the improvement Mechanisms, Role of Guidance and Councelling in the improvement of Maladjustment.

PAPER II EDUCATIONAL THOUGHT AND SYSTEMS

1. Legal and Constitutional provision of Education. Role of local bodies, state and centre in providing education.
2. Contribution to Education of Dewey, Gandhi, Tagore and Montessori.
3. Modern Trends and practised in Education, Educational Technology and Mass Media, International Cooperation in Education, Distance Education and open learning systems, Environmental Education; National Literacy Mission (NLM).
4. Need and importance of Educational Aims; Immediate and Ultimate aims of Education, Process of Educational planning, Budgetting, accounting as 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 (Yaph Paul Committee)
 - (ii) Education for all (Delhi summit)
- (c) Education in the North-East with special reference to
 - (i) Special cultural and organisational features of tribal communities.
 - (ii) Problems and Issues
 - (iii) Role of Education in the modernisation of Tribal Communities.

ENGLISH ELECTIVE

PAPER I 100 marks

A detailed literary study of the Victorian Era with special reference to the works of the following writers :-

1. Alfred Lord Tennyson
2. Robert Browning
3. Rossetti
4. Mathew Arnold
5. Swinburne
6. Thackeray
7. George Eliot
8. Thomas Hardy
9. John Ruskin
10. Thomas Carlyle
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 Byzantium
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 Silviculture 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. Silviculture systems; Clear felling uniform, shelterwood 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*, *Albizia spp.*, *Arto carpus spp.*, *Bambusa spp.*, *Casuariana equisetifolia*, *Calbergio spp.*, *Anogeissus spp.*, *Dipterocarpus spp.*, *Calyptus spp.*, *Gmelina arborea*, *lager stroemia spp.*, *Populus spp.*, *Salmalia/malabarica*, *Shorea robusta*, *Teetona grandis*, *Terminalia spp.*, Social Forestry objectives, scope, necessity, agro forestry, extension forestry; recreation forestry, peoples participation.

Section B Forest Mensuration and Management.

Method of measuring diameter, girth, height and volume of trees; form doctor; volume estimation of stand; sampling methods; yield calculation; current annual increment; mean annual increment; sample plots; yield 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, olearosins fibres oil seeds nuts, rubber, canes, bamboo, medicinal plants, charcoal, apiary, sericulture and chellae, 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.

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 forest 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 in India, 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 analysis; 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 Forestry, Research and Education, Forest law; 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, planetable 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 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; cycles of erosion Davis and Penck fluvial, glacial and marine and Karstlandforms; 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 reefs, 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 Humn 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; ranksize and primate city distributions; city classifications; urban spheres of influence and the rural urban fringe; the internal structure of cities-theories and cross cultural comparisions, problems of urban growth in the world.
4. Political Geography - Concepts of nation and state; frontiers, boundaries and buffer zones; concept of heartland and rainland; 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 OF INDIA

PAPER II

Physical Aspects - Geological 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; polupation distribution, density, and growth, population problems and policies.

Resources Conservation and utilisation 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 regionalisation, green revolution, dry zone agriculture, and agricultural land use policy; food and nutrition; Rural economy, animal husbandry, social forestry and household industry.

Industry - History industrial development factors of localisation; study of mineral based; agro-based and forest based industries, industrial decentralization and industrial policy; industrial complexes and industrial regionalisation, identification of backward areas and rural industrialisation.

Transport and Trade-Study of the network of roadways, railways, airways and waterways, competition and complimentary in regional context; passenger and commodity flows, 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 urbanisation 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 frame-work 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 reorganisation; regional consciousness and national integration; the international boundary of India and related issues; India and gropolitics of the Indian Ocean area.

GEOLOGY

PAPER I

(General Geology, Geomorphology, Structural Geology, Palacontology 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 areas, deep sea trenches and mid-ocean ridges, sea-floor spreading and plate tectonics, Isostracy 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 branchiopods, bivalves, gortopods, 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 microfossils and their significance with special reference to petroleum exploration.

5. **Stratigraphy :**
Principles of Stratigraphy, Stratigraphic classification and nomenclature. Standard stratigraphical scale, Details 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 preconstructions.

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 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 rockforming 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 gneisses, charnockites, Deccan basalts. Processes of formation of sedimentary rock. Diagenesis and lithification. Textures and structures and their significance, classification of Sedimentary rocks, classic and non-classic. Heavy mineral and their significance. Elementary concept of depositional environments, sedimentary facies and provenience. 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 type.

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 utilisation of minerals.

6. Applied Geology :
Essentials of prospecting and exploration techniques.
Principle methods of mining, sampling, ore-dressing and beneficiation. Application of Geology in Engineering works. Elements of soil and ground-water geology and geochemistry. Use of serial photographs in geological investigations.

HISTORY

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 Texts. Differences and similarities between
Indus civilization 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 Act.
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 sects) Art (Gandhara, Mathura and other schools).
Contacts with Central Asia.
6. The Gupta Age.
Rise and fall of the Gupta Empire, the Vakatakas, Administration Society Economy, Literature,
Art and Religion, Contacts with South East Asia.
7. Post-Gupta Period (B.C. 500 - 750 A.D).
Pushyabhutis, The Mukharis. The later Guptas. Harshvardhana 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 A.D) INDIA : 750 A.D to 1200 A.D

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 Systems, 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-Tughlag; 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 Revivakist Movement; Social and Religious Significance of the Chaitanya Movement, impact of Hindu Society on Muslim Social Life.
13. The Vijaynagar Empire : its origin and growth; contribution to art literature and culture, social and economic conditions; system of administration; breakup 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. Expansion of the Mughal Empire under Akbar : political unification; new concept of monarchy under Akbar; Akbar's religio-political outlook; Relations with the non-Muslims.
17. Growth of regional languages and literature during the medieval period. Development of art and architecture.
18. Political ideas and institutions; Nature of the Mughal State, Land Revenue administration; The Mansabdari and the Jagirdari system, the land structure and the role of Zamindars, agrarian relations, the military organisation.
19. Aurangzeb's religious policy, expansion of the Mughal Empire in Deccan; Revolts against Aurangzeb-Character and consequences.
20. Growth of urban centres; industrial; economy-urban and rural; Foreign Trade and Commerce. The Mughals and the European trading companies.
21. Hindu Muslim relations; trends of integration; composite culture (16th to 18th centuries).
22. 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.
23. Disintegration of the Mughal Empire, Emergence of the new Regional States.

MODERN INDIA**(1757 - 1947)****PAPER II
SECTION 'A'**

1. Historical Forces and Factors which led to the British conquest of India with special reference 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 structure and policies. Revenue, Judicial and Social and Educational and their linkages with British colonialism.
4. British economic policies and their impact. Commercialisation of agriculture, Rural indebtedness, Growth of agricultural 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 peasants 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 Disobdience and Quit Indian Movement; Trade Union and peasate movements State(s) people movements Rise and Growth of Left-Wing within the Congress-The Congress Socialists and communists; British official responses 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.

WORLD HISTORY (1500 - 1950)

SECTION B

- 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 Years' 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).
Socialist and Labour Movements in Europe
- C. Consolidation of Large Nation States. The Unification of Italy. 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 Ottaman 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 Kamalaturk. 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) 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
- (a) Objectives and principles of home furnishing
 - (b) Flower arrangement, principles and types
 - (c) Accessories

II CLOTHING AND 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
- 1) Objectives of Finishes
 - 2) Kinds of Finishes
- D. Dyeing and printing of textiles
- 1) Study of different indigenous and chemical dyes
 - 2) Printing-Block, screen, discharge, Resist
- F. Clothing
- 1) Importance of clothing
 - 2) Sociological and psychological aspects of clothing
 - 3) 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. Manutrition, and optimum Nutrition :
- 1) Definition
 - 2) Protein Calorie Malnutrition
 - 3) Kwashiorkar
 - 4) Marasmus
 - 5) Obesity
- D. Diet Therapy:-
- 1) Principles of therapeutic diets
 - 2) Types of therapeutic diets - Liquid, Semisolid, 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. DHILD 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 stage :
 - 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 and Development
 - d) Post natal care of mother
 - e) Care of new born baby
- E. Breast feeding and bottle feeding
 - 1) Advantages and disadvantages of each
 - 2) Weaning
- F. Child Psychology :
Definition, Meaning and scope

LAW**PAPER I****1. CONSTITUTIONAL LAW OF INDIA**

1. Nature of the Indian constitution : The distinctive features its federal character
2. Foundational Rights : Directive Principles and their relationship with Fundamental Rights; Fundamental Duties.
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 Service 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 recognised 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 State : 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 : bases of jurisdiction, immunity from jurisdiction
11. Extradiction 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 recourse to force; aggression, self-defence, intervention
18. Legality of the use of nuclear weapons : ban on testing of nuclear weapons; Nuclear Non-Proliferation Treaty.

PAPER II

1. LAW OF CRIMES AND TORTS :

LAW OF CRIMES

1. Concept of Crimes; actus reus means 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

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

MIZO ELECTIVE PAPER-I

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

A. 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 chhunga hlate
 - (1) Tlangthim chhaklam kei ka en ang - Zosaphluia (D.E. Jones)
 - (2) Thlalera ka vahvai chhung hian - Liangkhaia
 - (3) Ka lungchhia hi man pek kha hriain - Zosaphara (E. Rowlands)
- (c) Kum 1920 - 1940 chhunga hlate
 - (1) Pialral ka ngai - chang 5
 - (2) Lei Lal puan ropui chu - C.Z. Huala
 - (3) Tlang a dang lung a leng - Saihnuna
- (d) Kum 1940 - 1965 chhunga hlate
 - (1) Ramthar Zai - chang 5
 - (2) Chunnu lungmawl ka di parte - (Kaihlek hla)
 - (3) Hmangaihna - Vankhama
 - (4) Lengdun ila - Lalzuthanga
 - (5) Vanhnuai khuavel sakhming chhiar in - Rokunga
- (e) Kum 1965 hnulam hlate
 - (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 - Zikpui Pa
- 3) Harsatna - J. Malsawma
- 4) Rihdil leh Mizoram - Siamkima Khawlhing
- 5) Huaisn - Darchhawna
- 6) Khuailui ral - Lalzuia Colney
- 7) Mizo tlawmngaihna a sir lehlam - Sangzuala Pa

B. FICTION/THAWNTHU PHUAH

- 1) Sialton Officia - C. Thuamluaia
- 2) Phira leh Ngurthanpari - Lalzuithanga
- 3) Pangpar Bawm (Lehlin) - Rokhuma Rev.

MATHEMATICS

PAPER : I

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

LINEAR ALGEBRA

Vector space, bases, dimension of a definitely generated space, Linear transformations, Rank and nullity of linear transformation, Cayley Hamilton theorem, Eigenvalues and Eigenvectors.

Matrix of a linear transformation. Row and Column reduction. Echelon form. Equivalence, Congruence and similanty. Reduction to economical 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, Taylor's theorem, indeterminate forms, Maxima and Minima, Curve Tracing.

Asymptotes.

Functions of several variables, 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 coordinates. 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 coefficient. The complementary function and the particular integral of -

ax,	ax,	ax,	m,	ax,	Bx,	ax,	Bx,
e,	cos,	sin,	x,	c,	cos,	c,	sin,

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 co-ordinates, 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, 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, heavy fluids, Equilibrium of fluids under given systems of forces. Centre of Pressure. Thrust of curved surfaces, Equilibrium of floating bodies. Stability of equilibrium and Pressure of gases, problems relating to atmosphere.

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.

Mechanics, Hydrodynamics, Numerical Analysis, Statistics including probability operation Research.

ALGEBRA

Groups, sub-groups, normal sub-groups, homomorphism, of groups quotient groups, Basic Misemorphism. Slow theorems, Permutation Groups, Cayley's thereorem. Rings and Principal Ideals domains, unique factorisations and Euclidean domains. Field Extentions. finite fields.

REALANALYSIS

Metric spaces, their topology with special reference to sequence in a metric space, Cauchy sequence, Completeness. Completion, Continuous functions. Uniforms.

Properties of continuous functions on Compact sets. Riemann Steilities 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, Rearrangement of series, Uniform convergence, infinite products, Continuity, differentiability and integrability for series, Multiple integrals.

COMPLEXANALYSIS

Analytic functions, Cauchy's theorem, Cauchy's integral formula, power series, Tailor'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, Constraints holonomic and non holonomic systems. D' Alerabert's principle and Languages' equations. Moment 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.

NUMERICALANALYSIS

Transcendental and Polynomial Equations, Methods of tabulation, bisection requlataisi, secants and Newton-Rapnson 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 - Adams' and Milne's method, convergence and stability, Runge-Kutta Method's. 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 shepherd's corrections.

Comulants 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 inter-section etc. Probability Classical relative frequency and axiomatic approaches, Probability in continuum, probability space, Conditional probability and independence. Basic laws of Probability. Probability of combination of events, Bayes, theorem, Random variable Probability function, Probability density function. Distribution function. Mathematical expectation. Marginal and conditional expectation.
3. Probability distributions :- Binomial, Poisson, Normal, α , α . 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 I.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.

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.
2. 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.
3. The emergence and nature of the modern State : Sovereignty ; Monistic and Pluralistic analysis of sovereignty : Power Authority and Legitimacy.
4. Political obligation : Resistance and Revolution ; Rights, Liberty, Equality, Justice.
5. Theory of Democracy.
6. 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, modernisation 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 Rammohan Roy, Dadabhai Naurojy, Gokhale, Tilak, Sri Aurobindo, Iqbal, Jinnah, Gandhi, D.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.

PAPER II**PART I**

1. The nature and functioning of the Sovereign state system.
2. Concepts of the 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 resources.
10. The Role and International law in International relations; The international court of justice.
11. Origin and Development of International, Organisations : The United Nations and Specialized Agencies; their roles in international relations.
12. Regional Organisation : QAS, OAU, the Arab League, the ASEAN, the EEC their role in international relations.
13. Arms race disarmament and arms control; Conventional and nuclear arm, 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" Convert 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.
3. The conflict situation in West Asia.
4. Conflict and co-operation in South 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 policy and relations; India and the Super Powers; India and its neighbour; India and South-east-Asia; Indian and African problems; India's economic diplomacy, India and the question of nuclear weapons.