SECTION I
PLAN OF EXAMINATION

1. The competitive examination comprises two successive stages:

(i) Civil Services (Preliminary) Examination (Objective Type) for the selection of candidates for Main Examination; and

(ii) Civil Services (Main) Examination (Written and Interview) for the selection of candidates for the Meghalaya Civil Service.

2. The Main Examination will consist of written examination and an interview test. The written examination will consist of 8 papers of conventional essay type in the subjects set out in sub-section (B) of Section II out of which one paper will be of qualifying in nature. Marks obtained in Interview for Personality Test will be counted for ranking.

3. Marks thus obtained by the candidates in the Main Examination (written part as well as interview) would determine their final ranking.

SECTION II

Scheme and subjects for the Preliminary and Main Examination.

A. PRELIMINARY EXAMINATION:

The Examination shall comprise of two compulsory Papers of 200 marks each.

Note:

(i) Both the question papers will be of the objective type (multiple choice questions)
(ii) The General Studies Paper-II of the Civil Services (Preliminary) Examination will be a qualifying paper
(iii) Details of the syllabi are indicated in Part A of Section III.

B. MAIN EXAMINATION:

The written examination will consist of the following papers:-

QUALIFYING PAPER

Paper – English – 300 Marks

PAPERS TO BE COUNTED FOR MERIT

Paper I – Essay – **250 Marks**

Paper II – General Studies – I (Indian Heritage and Culture, History and Geography of the World and Society) **– 250 Marks**

Paper III – General Studies – II (Governance, Constitution. Polity, Social Justice and International Relations) **– 250 Marks**

Paper IV – General Studies – III (Technology, Economic Development, Bio – Diversity, Environment, Security and Disaster Management) **– 250 Marks**

Paper V – General Studies – IV (Ethics, Integrity and Aptitude) **– 250 Marks**

Paper VI, **Paper VII** } One Optional Subject from the list of Optional Subjects of Main Examination (250 Marks each paper) - -**500 Marks**

Sub Total (Written Test) -1750 Marks
Personality Test - 275 Marks
Grand Total - 2025 Marks

Candidates may choose any one of the optional subjects from amongst the list of subjects.

Note:

(i) The paper on English (Paper A) will be of Matriculation or equivalent standard and will be of qualifying nature only. **The marks obtained in this paper will not be counted for ranking**.

(ii) Marks obtained by the candidates for the Paper I-VII only will be counted for merit ranking.

2. LIST OF OPTIONAL SUBJECTS FOR MAINS EXAMINATION

(l)Agriculture
(2) Animal Husbandry and Veterinary Science
(3) Anthropology
(4) Botany
(5) Chemistry
(6) Civil Engineering
(7) Commerce & Accountancy
(8) Economics
(9) Education
(10) Electrical Engineering
(11) English
(12) Garo
(13) Geography
(14) Geology
(15) Hindi
(16) History
(17) Khasi
(18) Law
(19) Management
(20) Mathematics
(21) Mechanical Engineering
(22) Medical Science
(23) Philosophy
(24) Physics
(25) Political Science and International Relations
(26) Psychology
(27) Public Administration
(28) Sociology
(29) Statistics
(30) Zoology.

Note: (i) The question papers for the examination will be of conventional (essay) type.
(ii) Each paper will be of three hours duration.
(iii)The details of the syllabi are in part B of section III.

C. INTERVIEW TEST

The candidate will be interviewed by the Commission who will have before them a record of his career. He will be asked questions on matters of general interest. The object of the interview is to assess the personal suitability of the candidate for a career in public service by the Commission. The test is intended to judge the mental caliber of a candidate. In broad terms this is really an assessment of not only his intellectual qualities but also social traits and his interest in current affairs. Some of the qualities to be judged are mental alertness, critical powers of assimilation, clear and logical exposition, balance of judgment, variety and depth of interest, ability for social cohesion and leadership, intellectual and moral integrity.

2. The technique of the interview is not that of a strict cross-examination but of a natural, though directed and purposive conversation which is intended to reveal the mental qualities of the candidate.

3. The interview test is not intended to be a test either of the specialized or general knowledge of the candidates which has been already tested through their written papers. Candidates are expected to have taken an intelligent interest not only in their special subjects of academic study but also in the events which are happening around them both within and outside their own State or Country as well as in modern currents of thought and in view discoveries which should rouse the curiosity of well educated youth.

SECTION III
SYLLABI FOR THE EXAMINATION

Part A- Preliminary Examination

Paper I – (200 marks) Duration: Two hours

- Current events of national and international importance
- History of India and Indian National Movement.
- Indian and World Geography - Physical, Social, Economic Geography of India and the World
- Indian Polity and Governance - Constitution, Political System, Panchayati Raj, Public Policy, Rights Issues, etc
- Economic and Social Development - Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, etc.
- General issues on Environmental Ecology, Bio-diversity and Climate Change
- General Science.

Paper II – (200 marks) Duration: Two hours

- Comprehension
- Interpersonal skills including communication skills;
- Logical reasoning and analytical ability
- Decision-making and problem solving
- General mental ability
- Basic numeracy (numbers and their relations, orders of magnitude, etc.) (Class X level), Data interpretation (charts, graphs, tables, data sufficiency etc. - Class X level)

Note I: Paper –II of the Civil Services (Preliminary) Examinations will be a qualifying with minimum qualifying marks.

Note II: The questions will be of **multiple choice objective type.**

Note III: It is mandatory for the candidate to appear in both the papers of Civil Services (Prelim) examination for the purpose of evaluation. Therefore a candidate will be disqualified in case he/ she does not appear in both the papers of the Preliminary Examination.

Part B- Main Examination

The main Examination is intended to assess the overall intellectual traits and depth of understanding of candidates rather than merely the range of their information and memory.

The nature and standard of questions in the General Studies papers (Paper II to Paper V) will be such that a person will be able to answer them without any specialized study. The questions will be such as to test a candidate's general awareness of a variety of subjects, which will have relevance for a career in Civil Services. The questions are likely to test the candidate's basic understanding of all relevant issues, and ability to analyze, and take a view on conflicting socio-economic goals, objectives and demands. The candidates must give relevant, meaningful and succinct answers.

The scope of the syllabus for optional subject papers (Paper VI and Paper VII) for the examination is broadly of the honours degree level i.e. a level higher than the Bachelors' Degree and lower than the Masters' Degree. In the case of Engineering, Medical Science and law, the level corresponds to the bachelors' degree.

Syllabi of the papers included in the scheme of Civil Services (Main) Examination are given as follows:-

QUALIFYING PAPER

Paper A – English – 300 Marks

The aim of the paper is to test the candidates' ability to read and understand serious discursive prose, and to express his ideas clearly and correctly in English.

The pattern of questions would be broadly as follows

(i) Comprehension of given passages
(ii) Precis Writing
(iii) Usage and Vocabulary
(iv) Short Essays

Note 1: The paper on English will be of Matriculation or equivalent standard and will be of qualifying nature only. **The marks obtained in this paper will not be counted for ranking**.

PAPERS TO BE COUNTED FOR MERIT

Paper I – Essay **– 250 Marks**

Essay: Candidates may be required to write essays on multiple topics. They will be expected to keep closely to the subject of the essay to arrange their ideas in orderly fashion, and to write concisely. Credit will be given for effective and exact expression.

Paper II – General Studies – I (Indian Heritage and Culture, History and Geography of the World and Society) **– 250 Marks**

- Modern Indian history from about the middle of the eighteenth century until the present- significant events personalities, issues
- The Freedom Struggle its various stages and important contributors/contributions from different parts of the country
- Post-independence consolidation and reorganization within the country
- History of the world will include industrial revolution, world wars, colonization, decolonization political philosophies like communism, capitalism socialism etc
- Salient features of Indian Society, Diversity of India
- Role of women and women's organization, population and associated issues, poverty and developmental urbanization, their problems and their remedies. Effects of globalization on Indian society.
- Social empowerment, communalism, regionalism & secularism.
- Salient features of world's physical geography.
- Important Geophysical phenomena such as earthquakes, Tsunami, Volcanic activity, cyclone etc geographical features and their location-changes in critical geographical features (including water-bodies and ice-caps) and in flora and fauna and the effects of such changes.

Paper III – General Studies – II (Governance, Constitution. Polity, Social Justice and International Relations) **– 250 Marks**

- Indian Constitution-historical underpinnings evolution, features, amendments, significant provisions and basic structure
- Functions and responsibilities of the Union and the States, issues and challenges pertaining to the federal structure, devolution of powers and finances up to local levels and challenges therein
- Separation of powers between various organs dispute redressal mechanisms and institutions
- Parliament and State legislatures Structure functioning, conduct of business, powers & privileges and issues arising out of these.
- Structure, organization and functioning of the Executive and the Judiciary Ministries and Departments of the Government; pressure groups and formal/informal associations and their role in the Polity
- Salient features of the Representation of People's Act
- Appointment to various Constitutional posts, powers functions and responsibilities of various Constitutional Bodies
- Statutory, regulatory and various quasi-judicial bodies
- Welfare schemes for vulnerable sections of the population by the Centre and States and the performance of these schemes; mechanisms, laws, institutions and Bodies constituted for the protection and betterment of these vulnerable sections
- Issues relating to development and management of Social Sector/Services relating to Health, Education Human Resources.
- Issues relating to poverty and hunger Important aspects of governance, transparency and accountability, e-governance- applications, models successes, limitations, and potential; citizens charters transparency & accountability and institutional and other measures.
- Role of civil services in a democracy.
- India and its neighborhood- relations.
- Bilateral, regional and global groupings and agreements involving India and/or affecting India's interests

Paper IV – General Studies – III (Technology, Economic Development, Bio – Diversity, Environment, Security and Disaster Management) – **250 Marks**

- Indian Economy and issues relating to planning mobilization, of resources, growth, development and employment.
- Inclusive growth and issues arising from it
- Government Budgeting
- Major crops-cropping patterns in various parts of the country, different types of irrigation and irrigation systems storage, transport and marketing of agricultural produce and issues and related constraints technology in the aid of farmers.
- Issues related to direct and indirect farm subsidies and minimum support prices; Public Distribution System objectives, functioning limitations, revamping issues of buffer stocks and food security; Technology missions; economics of animal-rearing.
- Food processing and related industries in India- scope and significance location, upstream and downstream requirements, supply chain management.
- Land reforms in India
- Effects of liberalization on the economy, changes in industrial policy and their effects on industrial growth.
- Infrastructure: Energy, Ports, Roads, Airports, Railways etc
- Science and Technology- developments and their applications and effects in everyday life.
- Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights
- Conservation, environmental pollution and degradation environmental impact assessment.
- Disaster and disaster management Linkages between development and spread of extremism.

- Challenges to internal security through communication networks, role of media and social networking sites in internal security challenges, basics of cyber security; money-laundering and its prevention.
- Security challenges and their management in border areas linkages of organized crime with terrorism.
- Various Security forces and agencies and their mandate.

Paper V – General Studies – IV (Ethics, Integrity and Aptitude) **– 250 Marks**

This paper will include questions to test the candidates attitude and approach to issues relating to integrity, probity in public life and his problem solving approach to various issues and conflicts faced by him in dealing with society Questions may utilise the case study approach to determine these aspects. The following broad areas will be covered:-

- Ethics and Human Interface: Essence, determinants and consequences of Ethics in-human actions; dimensions of ethics; ethics in private and public relationships Human Values lessons from the lives and teachings of great leaders, reformers and administrators; role of family society and educational institutions in inculcating values
- Attitude: content, structure, function its influence and relation with thought and behavior; moral and political attitudes; social influence and persuasion
- Aptitude and foundational values for Civil Service integrity, impartiality and non-partisanship, objectivity dedication to public service, empathy, tolerance and compassion towards the weaker-sections
- Public/Civil service values and Ethics in Public administration: Status and problems; laws, rules, regulations and conscience as sources of ethical guidance; accountability and ethical governance; strengthening of ethical and moral values in governance; ethical issues in international relations and funding corporate governance.
- Probity in Governance: Concept of public service; Philosophical basis of governance and probity ; Information sharing and transparency in government Right to Information, Codes of Ethics, Codes Conduct, Citizen's Charters, Work culture, Quality of service delivery, Utilization of public funds, challenges of corruption.
- Case Studies on above issues.

PAPER VI & PAPER VII

Optional Subject Papers I and II

Candidate may choose any optional subject from amongst the List of Optional Subjects given in Para 2

Agriculture - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

1. 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. Climate change – international convention and global initiatives, Green house effects and Global Warming, Advance tools for ecosystem analysis – Remote Sensing (RS)and Geographic Information Systems (GIS).

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

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.

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

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

4. 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, Irrigation projects in India, quality of irrigation water, effect of industrial effluents on soil and water pollution.

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

6. 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. Marketing management strategies for development, market intelligence. Price fluctuations and their cost, role of cooperatives in Agricultural economy, Agricultural price policy, Crop Insurance.

7. 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 inchanization and its role in agricultural productional and rural employment. Training programmes for extension workers; lab-to-land programmes. Role of Krishi Vigyan kendra's (KVK) in dissemination of Agricultural Technology. Non-Government Organisation(NGO) and self help group for rural development.

Paper-II

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

2. 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.

3. Seed production and processing technologies. Seeds certification Seed testing and storage DNA finger printing and seed registration, Role of public and private sectors in seed production and marketing, Intellectual Property Rights (IPR) issues, WTO issues and its impact on Agriculture.

4. Physiology and its significance in agriculture. Imbibition, surface tension, diffusion and osmosis. Absorption and translocation of water. transpiration and water economy.

5. Enzymes and plant pigments; photosynthesis-modern concepts and factors affecting the process, aerobic and an aerobic respiration; C3, C4 and CAM mechanisms. Carbohydrate, protein and fat metabolism.

6. 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.

7. 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.

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

9. Food production and consumption trends in India. Food security and growing population – vision 2020. Reasons for grain surplus. National and International food policies, Production, procurement, distribution constraints. Availability of foodgrains, per capita expenditure on food. Trends in poverty, Public Distributions System and Below poverty Line population. Targeted Public Distribution System (PDS), policy implementation in context to globalization. Processing constrains. Relation of food production to National Dietary Guidelines and food consumption pattern. Food based dietary approaches to eliminate hunger. Nutrient deficiency – Micro nutrient deficiency : Protein Energy Malnutrition or protein Calorie Malnutrition (PEM or PCM), Micro nutrient deficiency and HRD in context of work capacity of women and children. Food grain productivity and food security.

Animal Husbandry and Veterinary Science Optional

of Part B - Main Examination of Civil Services Exam

Paper I

1. Animal Nutrition-Energy sources, energy, metabolism and requirements for maintenance and production of milk, meat, eggs and wool. Evaluation of feeds as sources of energy.

1.1. **Trends in protein nutrition**: sources of protein metabolism and synthesis, protein quantity and quality in relation to requirements. Energy protein ratios in ration.

1.2. **Minerals in animal diet :** Sources, functions, requirements and their relationship of the basic minerals nutrients including trace elements.

1.3. **Vitamins, Hormones and Growth Stimulating, substances** : Sources, functions, requirements and inter-relationship with minerals.

1.4 **Feed additives -** Methane inhibitors, probiotics, enzymes, antibiotics, hormones, oligosaccharides, antioxidants, emulsifiers, mould inhibitors, buffers etc. Use and abuse of growth promoters like hormones and antibiotics – latest concepts.

1.5 Conservation of fodders. Storage of feeds and feed ingredients. Recent advances in feed technology and feed processing. Anti-nutritional and toxic factors present in livestock feeds. Feed analysis and quality control. Digestibility trials – direct, indirect and indicator methods. Predicting feed intake in grazing animals.

1.6. Advances in Ruminant Nutrition-Dairy Cattle: Nutrients and their metabolism with reference to milk production and its composition. Nutrient requirements for calves, heifers, dry and milking cows and buffaloes. Limitations of various feeding systems.

1.7 Advances in ruminant nutrition, poultry-nutrients and their metabolism with reference to poultry, meat and egg production, Nutrients requirements and feed formulation and broilers at different ages.

1.8 Advances in Non-Ruminant Nutrition-Swine-Nutrients and their metabolism with special reference to growth and quality of meat production, Nutrient requirement and feed formulation for baby-growers and finish pigs.

1.9. **Advances in Applied Animal Nutrition:** A critical review and evaluation of feeding experiments, digestibility and balance studies. Feeding standards and measures of food energy. Nutrition requirements for growth, maintenance and production. Balanced rations.

2. Animal Physiology

2.1 **Growth and Animal Production :**- Prenatal and postnatal growth, maturation, growth curves, measures of growth, factors affecting growth, conformation, body composition, meat quality.

2.2 **Milk Production and Reproduction and Digestion** : Current stains of hormonal control of mammary development, milk secretion and milk ejection. Male and Female reproduction organ, their components and function. Digestive organs and their functions.

2.3 **Environmental Physiology** : Physiological relations and., their regulation; mechanisms of adaption, environmental factors and regulatory mechanism involved in animal behaviour, methods of controlling climatic stress.

2.4 **Semen quality :** Preservation and Artificial Insemination-Components of semen, composition of spermatozoe, chemical and physical properties of ejaculated semen, factors affecting semen **in vivo** and **in vitro.** Factors affecting semen production and

quality preservation, composition of diluents, sperm concentration, transport of diluted semen. Deep Freezing techniques in cows, sheep and goats, swine and poultry.

Detection of oestrus and time of insemination for better conception.

3. **Livestock Production and Management** : 3.1 Commercial Dairy Farming-Comparison of dairy farming in India with advanced countries. Dairying under fixed farming and as a specialised farming, economic dairy farming, Starting of a dairy farm. Capital and land requirement, organisation of the dairy farm.

Procurement of goods; opportunities in dairy farming, factors determining the efficiency of dairy animal, Herd recording, budgeting, cost of milk production; pricing policy; Personnel Management. Developing Practical and Economic ration for dairy cattle; supply of greens throughout the year, field and fodder requirements of Dairy Farm, Feeding regimes for day and young stock and bulls, heifers and breeding animals, new trends in feeding young and adult stock; Feeding records.

3.2. Commercial meat, egg and wool production: Development of practical and economic rations for Sheep, goats, pigs, rabbits and poultry. Supply of greens, fodder, feeding regimens for young and mature stock. New trends in enhancing production and management. Capital and land requirements and socio-economic concept.

3.3. Feeding and management of animals under drought, flood and other natural calamities.

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

4.1 **Population Genetics applied to Animal Breeding:** Quantitative Vs. qualitative traits; Hardy Weinberg Law; Population Vs. individual; Gene and genotypic frequency; Forces changing gene frequency; Random drift and small populations; Theory pf path coefficient; Inbreeding, methods of estimating inbreeding coefficient, systems of inbreeding; Effective population size; Breeding value, carnation of breeding value, dominance and epistatic deviation; partitioning of variation; Genotype X environment correlation and genotype X environment interaction; Role of multiple measurements; Resemblance between relatives.

4.2 **Breeding Systems** : Heritability, repeatability and genetic and phenotypic correlations, their methods of estimation and precision of estimates; Aids to selection and their relative merits; Individual, pedigree, family and within family selection; Progeny testing; Methods of selection; Construction of selection indices and their uses; Comparative evaluation of genetic gains through various selection methods; Indirect selection and Correlated response; Inbreeding, upgrading, cross-breeding and synthesis of breeds; Crossing of inbred lines for commercial production; Selection for general and specific combining ability; Breeding for threshold character.

Paper-II

1 Health and Hygiene

1.1. Histology and Histological Techniques : Stains-Chemical classification of stains used in biological work-principles of staining tissues-mordants-progressive & regressive stains-differential staining of cytoplasmic and connective tissue elements-Methods of preparation and processing of tissues-celloidin embedding-Freezing microtomy- Microscopy-Bright field microscope and electron microscope. Cytology-structure of cell, organells & inclusions; cell division-cell types-Tissues and their classification-embryonic and adult tissues-Comparative histology of organs:- vascular, Nervous, digestive, respiratory, musculo-skeletal and urogenital systems-Endocrine glands-Integuments-sense organs.

1.2. **Embryology** : Embryology of vertebrates with special reference to aves and domestic mammals-gametogenesis-fertilization-germ layers-foetal membranes & placentation-types of placenta in domestic mammals-Teratology-twin & twinning-organogenesis-germ layer derivatives-endodermal, mesodermal and ectodermal derivatives.

1.3 **Bovine Anatomy-Regional Anatomy** : Paranasal sinuses of OX-surface anatomy of salivary glands. Regional anatomy of infraorbital, maxillary, mandibuloalveolar, mental & coronal nerve block-Regional anatomy of paravertebral nerves, pudental nerve, median, ulnar & radial nervestibial, fibular and digital nerves-Cranial nerves-structures involved in epidural anaesthesia-superficial lymph nodes-surface anatomy of visceral organs of thoracic, abdominal and pelvic cavities-comparative features of locomotor apparatus & their application in the biomechanics of mammalian body.

1.4 **Anatomy of Fowls** : Musculo-skeletal system-functional anatomy in relation to respiration and flying, digestion and egg production.

1.5 Physiology of blood and its circulation, respiration; excretion, Endocrine glands in health and disease.

1.5.1 Blood constituents : Properties and functions-blood cell formation-Haemoglobin synthesis and chemistry-plasma proteins production, classification and properties; coagulation of blood; Haemorrhagic disorders-anticoagulants-blood groups-Blood volume-Plasma expanders-Buffer systems in blood. Biochemical tests and their significance in disease diagnosis.

1.5.2. **Circulation:** Physiology of heart, cardiac cycle-heart sounds, heart beat, electrocardiograms, Work and efficiency of heart-effect of ions on heart function-metabolism of cardiac muscle, nervous and chemical regulation of heart, effect of temperature and stress on heart, blood pressure and hypertension, Osmotic regulation, arterial pulse, vasomotor regulation of circulation, shock. Coronary & pulmonary circulation, Blood-Brain barrier-Cerebrospinal fluid-circulation in birds.

1.5.3 **Respiration** ; Mechanism of respiration, Transport and exchange of gases-neural control of respiration-chemo-receptors-hypoxia-respiration in birds.

1.5.4 Excretion: Structure and function of kidney-formation of urine methods of studying renal function-renal regulation of acid-base balance; physiological constituents of urine-renal failure-passive venous congestion-Urinary recreation in chicken-Sweat glands and their function. Biochemical tests for urinary dysfunction.

1.5.5 **Endocrine glands-** : Functional disorders, their symptoms and diagnosis. Synthesis of hormones, mechanism and control of secretion-hormonal receptors-classification and function.

1.6. General knowledge of pharmacology and therapeutics of **drugs** : Cellular level of pharmacodynamics and pharmacokinetics-Drugs acting on fluids and electrolyte balance-drugs acting on Autonomic nervous system-Modern concepts of anaesthesia and dissociative anaesthetics -Autocoids-Antimicrobials and principles of chemotherapy in microbial-injections-use of harmonics in therapeutics-chemotherapy of parasitic infections-Drug and economic persons in the. Edible tissues of animals-chemotherapy of Neoplastic diseases.

1.7. **Veterinary Hygiene with reference to water, air and habitation** : Assessment of pollution of water, air and soil-Importance of climate in animal health-effect of environment on animal function and performance-relationship between industrialization and animal agriculture-animal housing requirements for specific categories of domestic animals viz. pregnant cows & sows, milking cows, broiler birds-stress, strain & productivity in relation to animal habitation.

2. **Animal Diseases :**

2.1 Pathogenesis, symptoms, post-moretem lesions, diagnosis, and control of infection diseases of cattle, pigs and poultry, horses, sheep and goats.

2.2 Etiology, symptoms, diagnosis, treatment of production diseases of cattle, pig and poultry.
2.3 Deficiency diseases of domestic animals and birds.

2.4 Diagnosis and treatment of nonspecific condition like impaction, Bloat, Diarrhea, Indigestion, dehydration, stroke, poisoning.

2.5 Diagnosis and treatment of neurological disorders.

2.6 Principles and methods of immunization of animals against specific diseases-hard immunity-disease free zones-'zero' disease concept-chemoprophylaxis.

2.7 Anesthesia-local, regional and general-prenesthetic medication. Symptoms and surgical interference in fractures and dislocation. Hernia, choking, abomassal displacement-Caesarian operations. Rumenotomy-Castrations.

2.8 Disease investigation techniques-Materials for laboratory investigation-Establishment Animal Health Centre - Disease free zone.

3. **Veterinary** Public **Health**

3.1 Zoonoses : Classification, definition; role of animals and birds in prevalence and transmission of zoonotic diseases-occupational zoonotic diseases.'

3.2. **Epidemiology** : Principles, definition of epidemiological terms, application of epidemiological measures in the study of diseases and disease control, Epidemiological features of air, water and food borne infections.

3.3 **Veterinary Jurisprudence** : Rules and Regulations for improvement of animal quality and prevention of animal diseases-state and control Rules for prevention of animal and animal product borne diseases-S.P. C.A.-veterolegal cases-certificates-Materials and Methods of collection of samples for veterolegal investigation.

4 Milk and Milk Products Technology :

4.1 Milk Technology : Organization of rural milk procurement, collection and transport of raw milk. Quality, testing and grading raw milk, Quality storage grades of whole milk. Skimmed milk and cream.

Processing, packaging, storing, distributing, marketing defects and their control and nutritive properties of the following milks : Pasteurized, standardized, toned, double toned, sterilized, homogenized, reconstituted, recombined and flavoured milks. Preparation of cultured milks, cultures and their management, yoghurt, Dahi, Lassi and Srikhand. Preparation of flavoured and sterilized milks. Legal .standards, Sanitation requirement for clean and safe milk and for the milk plant equipment.

4.2 **Milk Products Technology** : Selection of raw materials, assembling, production, processing, storing, distributing and marketing milk products such as Butter, Ghee, Khoa, Channa, Cheese; Condensed, evaporated, dried milk and baby food; Ice cream and Kulli; by products; whey products, buttermilk, lactose and casein. Testing, grading, judging milk products-BIS and Agmark specifications, legal standards, quality control nutritive properties. Packaging, processing and operational control Costs.

5. **Meat Hygiene and Technology : *5.1* Meat Hygiene** :

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

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

5.2. Meat Technology

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

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

5.4. **Poultry Products Technology** : Chemical composition and nutritive value of poultry meat, pre slaughter care and management Slaughtering techniques, inspection, preservation of poultry meat, and products. Legal and BIS standards.

Structure, composition and nutritive value of eggs. Microbial spoilage. Preservation and maintenance. Marketing of poultry meat, eggs and products.

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

6. **Extension** : Basic philosophy, objectives, concept and principles of extension. Different Methods adopted to educate farms under rural conditions. Generation of technology, its transfer and feedback.

Problems of constraints in transfer of technology. Animal husbandry programmes for rural development.

Anthropology – Optional

of Part B - Main Examination of Civil Services Exam

Paper I

1.1 Meaning and scope of Anthropology

1.2 Relationship with other disciplines: Social Sciences, Behavioural Sciences, Earth Sciences, 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 systematics and taxonomy, major primate taxo, tertiary and quaternary fossil primates, Systematics of Hominoidea and Hominidac, Origin and evolution of *man-Homo erectus and Homo sapiens'.*

1.5 Phylogenetic status, characteristics and distribution of the following:

a) Plio-preleistocene fossil primates-*Oreopithecus.*

b) South and East African hominids-Plesianthropus/Australopithecus Africaus, Paranthropus, Australopithecus.

c) *Paranthropus-Homo erectus-Homo ercctus javanicus, Homo erectus pekinensis.*

d) *Homo Heidelbergensis.*

e) Neanderthal man-La-chapelle-au-saints (Classical type), Mt. Carmelites types (Progressive type).

f) Rhodesian man

g) Homo sapiens-Cromagnon, Grimaldi, Chancelede.

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

1.5 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 pie-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 structure and functions; stability and changes in family. Typological and processual approaches to the study of family. impact of urbanization, industrialization, education and feminist movements. Universality of family-a critique.

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

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

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

3.2 Concept of Social Change and Cultural Change:

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

3.4 Concept of Society: Society and Culture, Social Institution, Social Groups and Social stratification.

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

4.1 Definitions and functions of religion. Anthropological approaches to the study of religion-evolutionary, psychological and functional. Magic, witchcraft and sorcery; definitions and functions and functionaries: priest, shaman, medicine man and sorcerers. Symbolism in religion and rituals. Ethnomedicine. Myths and rituals: definitions and approaches to their study-structural, functional and processual relation with economic and political .structures.

5.1 Meaning, scope and relevance, principles governing production, distribution and consumption in communities subsisting on hunting-gathering, fishing, pastoralism, horticulture and other economic pursuits. Fomalist and substantivist debate-Dalton, Karl-polyanny and Marx approach and New Economic Anthropology.*Exchange: gifts, barter, trade, ceremonial exchange and market economy.

5.2 Theoretical foundations. Types of political organisations-band, tribe, chiefdom, state, concept of power, authority and legitimacy. Social control, law and justice in tribal and peasant societies.

6.1 Concepts of developmental Anthropological perspective. Models of development. Critiques of classical developmental theories. Concepts of planning and planned development. Concept of participatory development. Culture ecology and sustainable development. Displacement and rehabilitation.

7.1 Concept of research in anthroplogy, subjectivity and reflexivity in terms of gender class, ideology and ethics. Distinction between methodology, methods and techniques. Nature and explanation in anthropological research. Positivistics and non-positivistic approaches. Comparative methods; nature, purpose and methods of comparison in social and cultural anthroplogy. Basic techniques of data collection. Interview, participant and other forms of observation, schedules, questionnaire, case-study Methods, extended casestudy methods, life histories and secondary sources, oral history, genealogical method, participatory, learning and assessment (PIA). 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 karyotypc analysis), biochemical methods, immunological methods, D.N.A. technology and recombinant technologies.

8.3 Twin study method-zygosity, heritability estimates, present status of the twin study method and its applications.

8.4 Mendelian genetics in man-family study, single factor, multifactor, lethal, sub-lethal, and polygenic inheritance in man.

8.5 Concept of genetic polymorphism and selection, Mendelian population, Hardy-Weinberg law; causes and changes which bring down frequency-mutation, isolation, migration, selection, inbreeding and genetic drift. Consanguineous and non-consanguineous mating, genetic load, genetic effect of consanguineous and cousin marriages (statistical and probability methods for study of human genetics).

8.6 Chromosomes and chromosomal aberrations in man, methodology.

a) Numerical and structural aberrations (disorders)

b) Sex chromosomal aberrations-Klinefelter (XXY), Turner.(XO), Super female (XXX), intersex, and other syndromic disorders.

c) Autosomal aberrations-Down syndrome, Patau, Edward and Cri-du-chat syndromes.

d) Genetic imprints in human disease, genetic screening, genetic counselling, human DNA profiling, gene mapping and genome study.

8.7 Concept of race in histrogical and biological perspective. Race and racism, biological basis of morphological variation of non-metric and metric characters. Racial criteria, racial traits in relation to heredity and environment; biological basis of racial classification, racial differentiation and race-crossing in man.

8.8 Ethnic groups of mankind-characteristics and distribution in world, racial classification of human' groups. Principal living peoples of world. Their distribution and characteristic.

8.9 Age, sex and population variation as genetic marker-ABO), Rh blood groups, HLA, Hp, transferring, Gm, blood enzymes. Physiological characteristics-Hb level, body fat, pulse rate, respiratory functions and sensory perceptions in different cultural and socio-economic groups. Impact of smoking air pollutions, alcoholism, drugs and occupational hazards on health.

9.1 Concepts and Methods of Ecological Anthropology. Adaptation-social and cultural Deterministic theories-a critique. Resources-biological, non-biological and sustainable development. Biological adaptation-climatic, environmental, nutritional and genetic.

10.1 Relevance in understanding of contemporary society. Dynamics-of ethnicity at rural, tribal, urban and international levels. Ethnic conflicts and political developments. Concept of ethnic boundaries. Ethnicity and concept of nation state.

11.1 Concept -of human growth and development-stages of growth-prenatal, natal, infant, childhood, adolescence, maturity, senescence.

Factors affecting growth and development genetic, environmental, biochemical, nutritional, cultural and socio-economic.

- Ageing and senescence. Theories and observations-biological and chronological longevity. Human physique and 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 menarche, menopause and other bioevents to fertility. Fertility patterns and differentials.

12.2 Demographic theories-biological, social and cultural.
12.3 Demographic methods-census, registration system, sample methods, 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 Anthropo-genetics in medicine
13.9 Serogenetics and cytogenetics in reproductive biology.
13.10 Application of statistical principles in human genetics and Physical Anthropology.

PAPER II

1. Evolution of the Indian Culture and Civilization-Pre historic (Paleolithic, Mesolithic and Neolithic), Protohistoric (Indus Civilization). Vedic and post-Vedic beginnings. Contributions of the tribal cultures.

2. Demographic profile of India-Ethnic and linguistic elements in the Indian population and their distribution. Indian population, factors influencing its structure and growth.

3. The basic structure and nature of traditional Indian social system-a critique. Varnasharam, Purushartha, Karma,Rina and Rebirth. Theories on the origin of caste system, Jajmani system. Structural basis of inequality in traditional Indian society. Impact of Buddhism, Jainism, Islam and Christianity on Indian society.

4. Emergence, growth and development of anthropology in India-contributions of the 19th Century and early 20th, Century scholar-administrators. Contributions of Indian anthropologists to tribal and caste studies. Contemporary nature of anthropological studies in India.

5. Approaches to the study of Indian society and culture-traditional and contemporary.

5.1 Aspects of Indian village-Social organizations of agriculture, impact of market economy on Indian villages.

5.2 Linguistic and religious minorities-social, political and economic status.

6. Tribal situation in India-biogenetic variability, linguistic and socio-economic characteristics of the tribe populations and their distribution. Problems of the tribal Communities-land alienation, poverty indebtedness, low literacy, poor educational facilities, unemployment, underemployment, health and nutrition. Developmental projects-tribal displacement and problems of rehabilitation:

Development of forest policy and tribals, Impact of urbanisation and industrialization on tribal and rural populations.

7. Problems of exploitation and deprivation of Scheduled Castes/Scheduled Tribes and Other Backward Classes. Constitutional safeguards for Scheduled Tribes and Scheduled Castes. Social change and contemporary tribal societies: Impact of modern democratic institutions, development programmes and welfare measures on tribals and weaker sections. Emergence of ethnicity, tribal movements and quest for identity. Pseudo-tribalism.

8. Social change among the tribes during colonial and post-Independent India.
8.1 Impact of Hinduism, Christianity, Islam and other religious on tribal societies.
8.2 Tribe and nation state-a comparative study of tribal communities in India and other countries.
9. History of administration of tribal areas, tribal policies, plans, programmes of tribal development and their implementation. Role of N.G.Os.
9.1 Role of anthropology in tribal and rural development.
9.2 Contributions of anthropology to the understanding of regionalism, communalism and ethnic and political movements.

BOTANY - Optional

of Part B - Main Examination of Civil Services Exam

PAPER I

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

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

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

3. **Phanerogams: Gymnosperme:** Concept of Progymonosperms. Classification and distribution of Oymnosperms. Salient features of Cycadales, Conferrals and Gnetales, their structures and reproduction. General account of Cycadofilicales, Bennettitales and Cordiaitailes.

Angiosperms: Systematics, anatomy, embryology, palynology and phylogency. Taxonomic hierarchy; International Code of Botanical Nomenclature: Numerical taxomomy and chemotaxomomy; Evidence from anatomy, embryology and palynology.

Comparative account of various systems of Angiosperm Classification. Study of angiospermic families-Mangnoliaceae, Ranunculaceae, Brassicaceae (Cruci-ferac), Rosaceae, Leguminosac, Euphorbiaceae, Malvaceae, Dipterocar-paceae, Apiaceae (Umbelliferae), Asclepiadaceae, Verbenaccae, Solanaceae, Rubiaceae, Cucurbitaceae, Asteraceae (Composite), Poaceae (Gramineae), Arecaceae (Palmac), Liliaceae, Musaceae, Orchidaceae.

Stomata and their types. Anomalous secondary growth, Anatomy of C 3 and C 4 plants.

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

4. Plant Utility and Exploitation:

Origin of cultivated plants, Vavilov's centres of origin. Plants as sources for food, fodder, fibres, spices, beverages, drugs, narcotics, insecticides, timber, gums, resins and dyes.

Latex, cellulose Starch and their products. Perfumery. Importance of Ethnobotany in Indian context. Energy plantation. Botanical Gardens and Herbaria.

5. **Morphogenesis:** Totipotency, polarity, symmetry and differentiation. Cell, tissue, organ and protoplast culture. Somatic hybrids and Cybrids. Micropropagation, Somaclonal variation and its applications, Pollen haploids, embryo rescue methods and their applications.

PAPER-II

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

2. **Genetics, Molecular Biology and Evolution**: Development of genetics, and gene versus allele concepts (Pseudoalleles). Quantitative genetics and multiple factors. Linkage and crossing over -methods of gene mapping including molecular maps (idea of mapping function). Sex chromosomes and sex linked inheritance, sex determination and molecular basis of sex differentiation. Mutation (biochemical and molecular basis). Cytoplasmic inheritance and cytoplasmic genes (including genetics of male sterility). Prions and prion hypothesis. Structure and synthesis of nucleic acids and proteins. Genetic code and regulation of gene expression. Multigene families.
Organic evolution-evidences, mechanism and theories. Role of RNA in origin and. evolution.

3**. Plant Breeding, Biotechnology and Biostatistics:** Methods of plant breeding — introduction, selection and hybridization (pedigree, backcross, mass selection, bulk method). Male sterility and heterosis breeding. Use of apomixes in plant breeding. Micro propagation and genetic engineering methods of transfer of genes and transgenic crops; development and use of molecular markers in plant breeding.

Standard deviation and coefficient of variation (CV). Tests of significance (Z-test, t-test and chi-square tests). Probability and distributions (normal, binomial and Poisson distributions). Correlation and regression.

4. **Physiology and Biochemistry:** Water relations, Mineral nutrition and ion transport, mineral deficiencies. Photosynthesis-photochemical reactions, photophosphorylation and carbon pathways including C pathway (photorespiration), C3, C4 and CAM pathways. Respiration (anaerobic and aerobic, including fermentation-electron transport chain and oxidative phosphorylation. Chemiosmotic theory and ATP synthesis. Nitrogen fixation and nitrogen metabolism. Enzymes, coenzymes, energy transfer and energy conservation. Importance of secondary metabolites. Pigments as photoreceptors (plastidial pigments and phytochrome). Photoperiodism and flowering, vernalization, senescence. Growth substances-their chemical nature, role and applications in agri-horticulture, growth indices, growth movements. Stress physiology (heat, water, salinity, metal). Fruit and seed physiology. Dormancy, storage and germination of seed. Fruit ripening — its molecular basis and manipulation.

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

Forest types of India — Ecological and economic importance of forests, afforestation, deforestation and social forestry. Endangered plants, endemism and Red Data Books. Biodiversity. Convention of Biological Diversity, Sovereign Rights and Intellectual Property Rights. Biogeochemical cells. Global warming and climate change. Protected Area Network, farmers rights property rights.

CHEMISTRY - Optional

of Part B - Main Examination of Civil Services Exam

PAPER-I

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

2. Chemical bonding : Ionic bond, characteristics of ionic compounds, factors affecting stability of ionic compounds, lattice, energy, Born-Haber cycle; covalent bond, and its general characteristics, polarities of bonds in molecules and their dipole moments. Valence bond theory, concept of resonance and resonance energy. Molecular orbital theory (LCAO method); bonding in homonuclear molecules: H_2+, H_2 He_2 + to Ne_2, NO, Co, HF, CN BeI_{12} and CO_2. Comparison of valence bond and molecular oribtal theories, bond order, bond strength and bond length.

3. Solid State : Forms of solids, law of constancy of interfacial angles, crystal systems and crystal classes (crystallographic groups). Designation of crystal faces, lattice structures and unit cell. Laws of rational indices. Bragg's law. X-ray diffraction by crystals. Close packing, radious ratio rules, calculation of some limiting radius ratio values. Structures of NaCl, ZnS, CsCl, CaF_2, CdI_2 and rutile. Imperfections in crystals, stoichiometric and nonstoichiometric defects, impurity defects, semi-conductors. Elementary study of liquid crystals.

4. The Gaseous state : Equation of state for real gases, intermolecular interactions, liquefaction of gases and critical phenomena, Maxwell's distribution of speeds, intermolecular collisions, collisions on the wall and effusion. Thermal conductivity and viscosity of ideal gases.

5. Liquid State: Kelvin equation, Surface tension and surface enercy, wetting and contact angle, interfacial tension and capillary action.

6. Thermodynamics and statistical thermodynamics : Thermodynamic systems, states and processes, work, heat and internal energy; first law of thermo dynamics, work done on the systems and heat absorbed in different types of processes; calorimetry, energy and entropy changes in various processes and their temperature dependence.

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

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

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

8. Electrochemistry : Debye-Huckel theory of strong electrolytes and Debye-Huckel limiting Law for various equilibrium and transport properties. Galvanic cells, concentration cells; electrochemical series, measurement of e.m.f. of cells and its applications fuel cells and batteries.

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

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

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

11. Surface phenomena and catalysis : Absorption from gases and solutions on solid adsorbents, adsorption isotherms,-Langmuir and B.E.T. isotherms; determination of surface area, characteristics and mechanism of reaction on heterogeneous catalysts.

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

13. Coordination chemistry :

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

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

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

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

(e) **Main Group Chemistry :** Boranes, borazines, phosphazenes and cyclic phosphazene, silicates and silicones, Interhalogen compouns, Sulphur – nitrogen compounds, noble gas compounds.

14. General chemistry of 'f' block elements : Lanthanides and actinides; separation, oxidation states, magnetic and spectral properties; lanthanide contraction.

Paper-II

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

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

(b) **Reactive intermediates** : Generation, geometry, stability and reactions of carboniumions and carbanions, free radicals, carbenes, benzynes and nitrenes.

(c) **Substitution reactions** : S_N1, S_N2, S_Ni, $S_N1/$, $S_N2/$, $S_Ni/$ and $S_{RN}1$ mechanisms; neighbouring group participation; electrophilic and nucleophilic reactions of aromatic compound, including simple heterocyclic compounds-pyrrole, furan thiophene, indole.

(d) **Elimination reactions** : El, E2 and Elcb mechanisms; orientation in E2 reactions-Saytzeff and Hoffmann; pyrolytic syn elimination-acetate pyrolysis, Chugaev and Cope eliminations.

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

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

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

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

5. Polymeric Systems

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

(b) Preparation and properties of polymers : Organic polymers – polyethylene, polystyrene, polyvinyl chloride, Teflon, nylon, terylene, synthetic and natural rubber. Inorganic polymers-phosphonitrilic halides, borazines, silicones and silicates.

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

6. Synthetic uses of reagents : OsO_4, HIO_4, CrO_3, $Pb(OAc)_4$, SeO_2, NBS, B_2H_6, Na-liquid NH_3, $LiAlH_4$ $NaBH_4$, n-BuLi, MCPBA.

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

8. Principles of spectroscopy and applications in structure elucidation

(a) Rotational – Diatomic molecules; isotopic substitution and rotational constants.

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

(c) Electronic : Singlet and triplet states $n \rightarrow \pi$ and $\pi \rightarrow \pi^*$ transitions; application to conjugated double bonds and conjugated carbonyls-Woodward-Fieser rules.

(d) Nuclear magnetic resonance: Isochronous and anisochronous protons; chemical shift and coupling constants; Application of H_1 NMR to simple organic molecules.

(e) Mass spectrometry: Parent peak, base peak, daughter peak, metastable peak, fragmentation of simple organic molecules; McLafferty rearrangement.

Civil Engineering - Optional

of Part B - Main Examination of Civil Services Exam

Paper-1

Part-A

1. Engineering Mechanics, Strength of Materials and Structural Analysis.

1.1. 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' Alernbert's Principle, Collision of elastic bodies, rotation of rigid bodies, simple harmonic motion, Flywheel.

1. 2. 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.

1. 3. Deflection of beams : Mecaulay's method, Mohr's Moment area method, Conjugate beam method, unit load method. Torsion of Shafts, Transmission of power, close coiled helical springs. Elastic stability of columns, Euler's 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.

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

1.5. 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.

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

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

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

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

Part-B

2. Design of Structures : Steel, Concrete and Masonry Structures.

2.1 Structural Steel Design : Structural Steel : Factors of safety and load factors. Riveted, bolted and welded joints and connections. Design of tension and compression member, beams of built up section, riveted and welded plate girders, gantry girders, stancheons with battens and lacings, slab and gusseted column bases.

2.2 Design of highway and railway bridges : Through and deck type plate girder, Warren girder, Pratt truss. Design of Concrete and Masonry Structures :

2.3 Concept of mix design. Reinforced Concrete : Working Stress and Limit Stale method of design Recommendations of LS. codes Design of one way and two way slabs, stair-case slabs, simple and continuous beams of rectangular, T and L sections. Compression members under direct load with or without eccentricity, Isolated and combined footings.Cantilever and Counter fort type retaining walls.

2.4 Water tanks : Design requirements for Rectangular and circular tanks resting on ground.

2.5 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

3. Fluid Mechanics, Open Channel Flow and Hydraulic Machines

3.1 Fluid Mechanics : Fluid properties and their role in fluid motion, fluid statics including forces acting on plane and curve-surfaces.

3.2 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 to fluid flow problems, pipe flow, plane, curved, stationary and moving vanes, sluice gates, weirs, orifice meters and Venturi meters.

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

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

3.5 Boundary layer : Laminar and turbulent boundary layer on a flat plate, laminar sublayer, smooth and rough boundaries, drag and lift.

3.6 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.

3.7 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.

3.8 Hydraulic Machines and Hydropower : Centrifugal pumps-Types, characteristics, Net Positive Suction Height (NPSH), specific speed. Pumps in parallel.

Reciprocating pumps, Airvessels, 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

4. Geotechnical Engineering

Types of soil, phase relationships, consistency limits particles size distribution, classifications of soil, structure and clay mineralogy.

Capillary water and structural water, effectives trees and pore water pressure, Darcy's Law, factors affecting permeability, determination of permeability, permeability of stratified soil deposits.

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

Compaction of soil, field control of compaction. Total stress and effective stress parameters, pore pressure coefficients.

Shear strength of soils, Mohr Coulomb failure theory. Shear tests.

Earth pressure at rest, active and passive pressures, Rankine's theory, Coulomb's wedge theory, earth pressure on retaining wall, shcetpile 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 Infective Stress methods. Conventional methods of slices, stability number.

Subsurface exploration, methods of boring, sampling, penetration tests, pressure meter tests.

Essential features of foundation, types of foundation, design criteria, choice of type of foundation, stress distribution in soils, Business’s theory, New mark'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 lest, settlement of piles, lateral capacity. Foundation for Bridges. Ground improvement techniques preloading, sand drains, stone column, grouting, soil stabilization.

Paper-II

Part-A

Construction Technology, Equipment, Planning and Management

1. **Construction Technology** :

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

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

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

Building estimates and specifications; Cost of works; valuation.

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

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

2.2 Earth-work equipment : Power shovel hoe, bulldozer, dumper, trailors, and tractors, rollers, sheep fool roller.

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

3.1 Network analysis : CPM and PERT analysis. Float Times, cashing of activities, contraction of network for cost optimization, updating. Cost analysis and resource allocation.

Elements of Engineering Economics, methods 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

4. Survey and Transportation Engineering

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

4.2 Railways : Permanent way. sleepers, rail fastenings, ballast, points and crossings, design of turn outs, stations and yards, turntables, signals, and interlocking, level-crossing. Construction and maintenance of permanent ways : Super elevation, creep of rail, ruling gradient, track resistance, track effort, relaying of track.

4.3 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.

4.4 Drainage of roads : Surface and sub-surface drainage.

4.5 Traffic Engineering : Forecasting techniques, origin and destination survey, highway capacity. Channelized and un-channelized intersections, rotary design elements, markings, sign, signals, street lighting; Traffic surveys. Principle of highway financing.

Part-C

5. Hydrology, Water Resources and Engineering :

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

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

5.3 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.

5.4 Irrigation Engineering : Water requirements of crops : consumptive use, quality of water for irrigation, duty and delta, irrigation methods and their efficiencies.

5.5 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.

5.6 Water logging : causes and control, drainage system design, salinity.

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

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

5.9 Storage works : Types of dams, design, principles of rigid gravity and earth dams, stability analysis, foundation treatment, joints and galleries, control ojf seepage.

5.10 Spillways : Spillway types, crest gates, energy dissipation.

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

Part-D

6. Environmental Engineering

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

6.2 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.

6.3 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 stems, pumping stations and their operations.

6.4 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.

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

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

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

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

Commerce *&* Accountancy - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I
Accounting & Finance
Part-I
Accounting, Taxation *&* Auditing

1. Financial Accounting : Accounting as a financial information system; Impact of behavioural sciences. Accounting Standards e.g., accounting for depreciation, inventories, gratuity, research and development costs, long term construction contracts, revenue recognition, fixed assets, contingencies, foreign exchange transactions, investments and government grants. Advanced problems of company accounts, Cash Flow Statement, Earnings per Share. Amalgamation absorption and reconstruction of companies. Valuation of shares and goodwill. Employees Stock Option and Buy-Back of Securities. Preparation and Presentation of Company Final Accounts.

2. Cost Accounting : Nature and functions of cost accounting. Job Costing Process Costing Marginal Costing; Techniques of segregating semi-variable costs into fixed and variable costs. Cost-volume-profit relationship; aid to decision making including pricing decisions, shutdown etc. Techniques of cost control and cost reduction. Budgetary control, flexible budgets. Standard costing and variance analysis. Responsibility accounting, investment, profit and Cost centres. Incremental Analysis/Differential costing as a Tool of Pricing Decisions, Product Decisions, Make or Buy Decisions, Shut-Down Decisions etc.

3. Taxation : Income Tax : Defination. Basis of charge. Incomes which do not form part of total income. Simple problems of computation of income under various heads, i.e., salaries, income from house property, profits and gains from business or profession, capital gains, income of other persons included in assesses's total income. Aggregation of income and set off/carry forward of loss. Deductions to be made from Gross total Income.

4. Auditing : Company Audit: Audit related to Divisible Profits. Dividents, Special investigations. Tax audit. Audit of Banking, Insurance, Non-Profit Organization and Charitable Societies/Trusts/Organizations.

Part-II

5. Business Finance and Financial Institutions.

5.1. Finance Function : Nature, Scope and Objectives of Financial Management-Risk and Return relationship, Financial Analysis as a Diagnostic Tool.

5.2. Management of Working Capital and its Components: Forecasting working capital needs, inventory, debtors, cash and credit management.

5.3. Investment Decisions : Nature and Scope of Capital Budgeting-Various types of decisions including Make or Buy and Lease or Buy-Techniques of Appraisal and their application-Consideration of Risk and Uncertainty-Analysis of Non-financial Aspects.

5.4. Rate of Return on Investments: Required Rate of Return-its measurement-Cost of Capital Weighted Average Cost-Different Weights.

5.5. Concepts of Valuation : Valuation of firm's Fixed Income Securities and Common Stocks. Evident and Retention Policy-Residual Theory or Dividend Policy-Other Models-Actual Practices.

5.6. Capital Structure : Leverages-Significance or Leverages-Theories of Capital-Structure with special influence to Modigliani and Miller approach. Planning the Capital Structure of a Company; EBIT-EPS Analysis. Cash-flow ability to service debt, Capital Structure Ratios, other methods.

5.7. Raising finance short term and long term : Bank finance-norms and conditions.

5.8. Financial Distress : Approaching BIFR under Sick Industrial Undertakings Act : Concept of Sickness, Potential Sickness, Cash Loss, Erosion of Network

5.9. Money Markets : The purpose of Money Markets, Money Market in India-Organization and working of Capital markets in India-Organization, Structure and Role of Financial Institutions in India. Banks and Investing Institutions-National and International Financial institutions their norms and types of financial assistance provided-inter-bank lending-its regulation, Supervision and control. System of Consortium-Supervision and regulation of banks. Monetary and Credit policy of Reserve Bank of India.

Paper-ll

Organization Theory, *Behaviours, Human Resource Management* and Industrial Relations

Part I

Organization Theory

1. Nature and concept of Organization : Organization goals, Primary and secondary goals, Single and multiple goals, ends means chain-Displacement, succession, expansion and multiplication of goals-Formal organization, Type, Structure-Line and Staff, functional matrix, and project-Informal organization-functions and limitations.

2. Evolution of organization theory : Classical, Neo-classical and system approach Bureaucracy; Nature and basis of power, sources of power, power structure and politics Organizational behaviour as a dynamic system : technical, social and power systems interrelations and interaction Perception--Status; system. Theoretical and empirical foundation of theories and' Models of motivation. Morale and productivity-Leadership : Theories and styles Management of conflicts in organization-transaction Quality of Work Life (QWL): Meaning and its impact on Performance, Ways of its Enhancement. Quality Circles (QC).

3. Human Resource Management (HRM): Meaning Nature and Scope of HRM, Human Resource Plsanning. Job Analysis, Job Description, Job Specificaton, Recruitment Process, Selection Process, Orientational and Placement, Trainng and Development Process Appraisal and 360^{O} Feed Back, Salary and Wage Administration, Job Evaluation, Employee Welfare, Promotions, Transfers and Separations.

4. Analysis-Significance of culture to organizations: Limits of rationality-Organizational change, adaptation, growth and development, Professional management Vs. family management, Organizational control and effectiveness.

Part-II

5. I**ndustrial Relations:** Nature and scope of industrial relations, the socio-economic set-up, need for positive approach. Industrial labour in India and its commitment-Stages of commitments. Migratory nature merits and shortcoming, Trade Union movement in India-origin, growth and structure; Attitude and approach of management of India-recognition Problems before Indian Trade Union movement.

6. Industrial disputes sources: Strikes and lockouts. Compulsory adjudication and collective bargaining approaches.

7. Worker's participation in management : Philosophy, rationale; present day state of affairs and future prospects. Prevention and settlement of industrial disputes in India.

8. Industrial relations in Public Enterprises: Absenteeism and labour turnover in Indian Industries-causes and remedies.

9. Relative wages and wage differentials : Wage policy. Wage policy in India; the Bonus issue. I.L.O. and India, Role of Personnel Department in the Organization.

Economics - Optional

of Parl B - Main Examination of Civil Services Exam

Paper-I

1. Ricardian, Marshallian and Walrasain approaches to price determination. Types of Markets and price determination. Criteria or Welfare improvement. Alternate theories of distribution.

2. Functions of money-Measurement of price level changes-Money and real balances-Monetary standards-High-powered money and the Quantity theory of money, its variants and critiques thereof Demand for and supply of money-The money multiplier. Theories of determination of interest rate-Interest and prices-Theories of inflation and control of inflation.

3. Full employment and Says' Law-underemployment equilibrium-Keynes' Theory of employment (and income) determination-Critiques of Keynesian Theory.

4. The modern monetary system-Banks, non-bank financial intermediaries, Discount House, and Central Rank. Structure of Money and financial markets-and control. Money market instruments, bills and bonds. Real and nominal interest rates. Goals and instruments of monetary management in closed and open economies. Relation between the Central Bank and the Treasury. Proposal for ceiling on growth rate of money.

5. Public finance and its role in market economy in stabilization, supply stability, allocative efficiency, distribution and development. Sources of revenue-Forms of Taxes and subsidies, their incidence and effects; Limits to taxation, loans, crowding-out effects, and limits to borrowing. Types of budget deficits-Public expenditure and its effects.

6. **International Economics**

(i) Old and New theories of International Trade.

a) Comparative advantage, Terms of trade and offer curve.
b) Product cycle and Strategic trade theories.
c) "Trade as an engine of growth" and theories of under-development in an open economy

(ii) Forms of protection: Tariff and quota.

(iii) Balance of Payments Adjustments Alternative Approaches.

a) Price versus income, income adjustments under fixed exchange rates.
b) Theories of policy mix.
c) Exchange rate adjustments under capital mobility.
d) Floating Rates and their implications for developing countries; Currency Boards.
(iv) (a) IMF and the World Bank.
(b) W.T.O.: TRIMS, TRIPS, Domestic Measures, Different Rounds of WTO talks.
(c) Trade Blocks and monetary unions.

7. Growth and development.

(i) Theories of growth : Classical and neo-classical theories; The Harrod model; economic development under surplus Labour; wage-goods as a constraint on growth; relative importance of physical and human capitals in growth; innovations and development; Productivity, its growth and source of changes thereof. Factors determining savings to income ratio and the capital-out put ratio.

(ii) Main features of growth : Changes in Sectoral compositions of income; Changes in occupational distribution; changes in income distribution; changes in consumption levels and patterns; changes in savings and investment and in pattern of investment. Case for arid against industrialization. Significance of agriculture in developing countries.

(iii) Relation between state, planning and growth, changing roles of market and plans in growth economic policy and growth.

(iv) Role of foreign capital and technology in growth: Economic development and International Trade and Investment Role of Multinationals. Planning and Economic Development changing Role of Market and planning, private partnership.

(v) Welfare indicators and measures of growth-Human development indices-The basic needs approach. Development and Environmental Sustainability : Renewable and Non renewable Resources, Environmental Degradation, Intergenerational equity development.

(vi) Concept of sustainable development; convergence of levels of living of developed and developing countries; meaning of self-reliance in growth and development.

Paper-II

1. Evolution of the Indian Economy till independence. The Colonial Heritage : Land System & Agriculture, Taxes, Money and credit. Trade, Exchange Rate, the "Drain of Wealth controversy" of late 19th Century". Randade's critique of Laissez-Faire; Swadeshi movement; Gandhi and-Hind Swaraj.

2. Indian Economics in Post-Independent: Era-Contributions of Vakil, Gadgil and Rao. National and per capita Income; Patterns, Trends, Aggregate and sectoral-composition and changes therein. Broad factors determining National Income and its distribution; Measures of poverty, fiends in below poverty-line proportion.

3. **Agriculture :** Institutional set-up of land system size of agriculture holdings and efficiency : Green Revolution and technological changes-Agricultural prices and terms of trade-Role of public distribution and farm-subsidies on agricultural prices and production. Employment and poverty in agriculture-Rural wages-employment schemes-growth experience-land reforms. Regional disparities in agricultural growth. Role of Agriculture in export.

4. **Industry :** Industrial system of India : Trends in Composition and growth. Role of public and private sectors, Role of small and cottage industries.

5. ***National and Per capital income :*** Patterns, trends, aggregate and sectoral composition and changes therein.

6. Broad factors determining National Income and distribution, measures of poverty, trends in poverty and inequality.

7. The post Liberalization Era :

(i) New Economic Reforms and Agriculture: Agriculture and WTO, Food processing, subsidies, Agricultural prices and public distribution system. Impact of public expenditure on agricultural growth.

(ii) New Economic policy and Industry : Strategy of industrialization, Privatization, Disinvestments, Role of foreign direct investment and multinationals.

(iii) New Economic policy and Trade : Intellectual property rights, and new EXIM policy.

(iv) New Economic Policy and Public Finance : Fiscal Responsibility Act.

(v) New Economic Policy and Monetary System Role of RBI under the new regime.

(vi) Planning : Relation between planning and markets for growth and decentralized planning, 73rd and 74th Constitutional amendments.

(vii) New Economic Policy and Employment : Employment and poverty, Rural wages, Employment Generation, Poverty alleviation schemes, New Rural, Employment Guarantee scheme.

(viii) Causes of inflation-role of monetary and supply factors in price level determination, policies towards control of inflation. Effects of inflation under open economy.

Education- Optional

of Parl B - Main Examination of Civil Services Exam

Paper- I

1. Educational Psychology

Concept, Need & Scope of Educational Psychology, Methods of Educational Psychology (Introspection, Observation, Case Study), Application of Educational Psychology in Teaching and Learning, Stages of Growth & Development, Adolescent Behaviour : Characteristics, Problems & Role of Education.

Intelligence : Concept and Nature, Role of Heredity & Environment in Determining Intelligence, Theories of Intelligence (Two factor & Multiple Intelligence), Creativity : Concept & Nature, Characteristics of a Creative Person, Promoting Creativity Through Education.

Meaning and Nature of Personality, Type and Trait Approaches to Personality, Factors Influencing Personality Development, Measurement of Personality, Individual Differences : Its Educational significance.

Learning : Meaning & Nature, Factors Influencing Learning, Theories of Learning : Trial & Error, Classical conditioning and Insight Learning, Transfer of Learning.

Guidance : Meaning, Nature, Scope & types, Need & Importance of Educational & Vocational Guidance Services in Schools, Aptitudes, Interest & Attitudes, Educational Achievements & Personality Traits.

Meaning, Nature & Scope of Counselling, Types of Counselling, Steps & Techniques of Counselling.

2. Foundations of Education

Education & Philosophy : Concept and their Relationship, Aims Of Education : Individual & Social, Objectives of Education at Different Levels, Role of Education in the Development of Human Value.

Idealism, Naturalism, Pragmatism.

Education and Democracy, Freedom & Discipline in Education, Components of Education and their Mutual relationship.

Nature & Scope of Educational Sociology, Education as a Social Process, Need for Sociological Approach to Education, School as a Social Sub-system.

Education as an Instrument of Social Change, Education and Modernization, Effect of Social Changes on Education.

Social Group : Primary & Secondary, Social Interaction & Socialization, Education & Cultural Heritage of India, Equalization of Educational Opportunities.

3. Educational Thought & Practices

Educational Thought & Practices in Post Vedic Period with reference to Upanishads, Educational Thought & Practices in Ancient Greece, Educational Thought & Practices in Ancient Rome.

Education Thoughts – Indian – Rabindra Nath Tagore, Aurobindo Ghosh, Swami Vivekananda

Educational thought–Western – John Comenius, Jean Jacques Rousseau, Bertrand Russell.

Modern Educational Thought – Radhakrishnan, J. Krishnamurthy, Paulo Freire.

Froebel's Kindergarten, Montessori Method, Dewey's Project Method, Gandhi's Basic Education. Distance Education, Non formal and continuing Education, Inclusive Education.

4. Educational Evaluation & Statistics

Concept of Measurement & Evaluation, Distinction Between Measurement & Evaluation, Process and purpose of Evaluation, Bloom's Taxonomy of Educational Objectives under Cognitive Domain.

Likert's Attitude Scale, Cattel's Sixteen Personality Factors (16PF), Standford Binet Test of Intelligence. Classification of Tests, Concept of Standardized & Teacher Made Test, Characteristics of a good test, Reliability and Method of Determining Reliability by Test – Retest Method, Validity and Method of Determining Content Validity.

Histogram, Frequency Polygon, Cumulative Frequency Curve, Ogive.

Measures of Central Tendency : Mean Median & Mode, Measures of Dispersion : Range, Quartile Deviation, Average Deviation and Standard Deviation.

Concept and types of Correlation, Spearman's Rank Difference Method of Correlation, Normal Probability curve : Concept & characteristics.

Paper- II

1. Educational System in India

Basic Ideas, Objectives , Curriculum, Methods of Teaching & Role of Teachers of the Following System :- Education in Ancient India : Vedic, Brahmanic & Buddhistic Education, Education in Medieval India.

Education in Colonial India (1813 – 1882) – Character Act (1813), Macaulay's Minute (1835), Wood's Despatch (1854), Hunter's Commission (1882)

Indian University Commission (1902), Sadler's Commission (1917), Hartog Committee (1929), Sargent Report (1944).

Education in the Indian Constitution, University Education Commission (1948-49), Secondary Education Commission (1952-1953), Indian Education Commission (1964-66) with Reference to School Education, Knowledge Commission Report (2007) with reference to Higher education Act (2009)

Concept of National System of Education, Primary Education : Recommendations & Programme of Action, Secondary Education : Recommendations & Programme of Action, Higher Education : Recommendations & Programme of Action.

Problems & Issues of Primary Education, Problems & Issues of Secondary Education, Problems & Issues of Higher Education in Meghalaya.

2. Contemporary Indian Education

Type of Pre-primary schools, Aganwadi's Balwadis, Creches' Day Care Centres, Integrated Child Development Service (ICDS), Role of Indian Council for Child Welfare (ICCW).

Sarva Shiksha Abhiyan (SSA) : Programme for Universalisation of Elementary Education, Role of Block Resource Centres (BRC'S), cluster Resource Centres (CRC'S) and village Education Committees (VEC'S), Literacy Mission.

Rashtriya Madhyamik Shiksha (RMSA), Vocationalization of Secondary Education, Role of NCERT, CABE and MBOSE, Navodaya Vidhyalaya's : Objectives and Quality Concerns.

Quality & Excellence in Higher Education, Role of UGC, NAAC and AICTE, Knowledge Commission report 2007 with reference to higher Education, Globalization of Higher Education.

Concept Need and Scope of Teacher Education, Pre-Service and In-Service Teacher Education Programmes, Role of DIET, CTE, DERT and NCTE in Teacher Education, Duties and Responsibilities of a Teacher.

Concept, Need, Scope and Programmes of the following:

Population Education, Environmental Education, Human Rights Education, Women Empowerment through Education.

3. Educational technology

Concept and Scope of Educational Technology, Types of Educational Technology, Systems Approach to Instruction.

Concept & Process of Communication, Types of Class Room Communication, Educational through Mass-Media, ICT in Education.

Programmed Instruction, Computer Aided Instruction, Teaching Aids : Types & Uses.

Teaching : Concepts, Function and Principles, Characteristics of Effective Teaching, Teaching Operations at various stages.

Methods of Teaching : Lecture, Demonstration, Problem solving and Discussion, Levels of Teaching : Memory, Understanding and Reflective level, Teacher Behaviour : Authoritarian, Democratic and Laissez faire.Skills of Teaching, Micro-teaching Team Teaching, Evaluation of Teaching.

4. School Management

Concept & Scope of School organization Management, Types of Educational Management : Centralized and Decentralized, Authoritarian & Democratic, Objectives and Principles of School Management, Characteristics of Successful school Management.

Meaning of Class Room Management, Principles of Class Room Management, Process of Class Room Management, Techniques of Class Room Management.

School Building and design of school plant, School Library, School laboratory, School office.

Function of a School, School time Table & Calendar, Teacher's Diary, Role of Headmaster & Teachers, Staff Meeting.

Meaning need & scope of inspection and supervision, Distinction between Inspection & Supervision, Objectives & function of supervision, Steps of School supervision.

Programmes of a School, Institutional Planning – Concept, need, objectives, principles and process, Organization of Co-curricular Activities, Evaluation of School Programme.

Electrical Engineering - Optional

of Part B - Main Examinational Civil Services Exam

Paper-I

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 networks, driving point and transfer functions; poles and zeros of network functions. Elements of networks synthesis. Filter-theory : design, and applications. Active filters. Circuit simulation : Input formats; methods of education formulation; solution of equations; output formats; SPICE.

2. 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.

3. E.M. Theory : Maxwell's equations, wave propagation in bounded media. Boundary conditions, reflection and refraction of plane waves. Transmission line : Distributed parameter circuits, travelling and standing waves, impedance matching, Smith chart. Waveguides : parallel plane guide, TE, TM and TEM waves, rectangular and cylindrical wave guides, resonators. Planar transmission lines; stripline, microstripline.

4. 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; sinusoidal oscillators : criterion for oscillation; single-transistor and OPAMP configurations. Function generators and wave-shaping circuits. Power supplies.

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

6. 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.

7. 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.

8. 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.

9. 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 or AM and FM receivers.

10. Microwaves and Antenna : Electromagnetic radiation, Propagation of waves : ground waves, sky wave, space wave, tropo spheric scatter propagation. Extraterrestrial communications. Antenna : Various types, gain, resistance, band-width, beam width and polarization, effect of ground. Antenna coupling; high frequency antennas; microwave antennas; special purpose antennas. Microwave Services : Klystron, magnetron, TWT, gun diodes, Impact; Bipolar and FETs, Microwave integrated circuits. Microwave measurements.

Paper-II

1. 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-lad compensators. Proportional, PI, PID controllers. State-variable representation and analysis of control systems. Principles of discrete-control systems.

2. 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.

3. Microprocessors arid microcomputers :8 - bit microprocessor : architecture, CPU, module design, memory interfacing, I/O, Peripheral controllers, Multiprocessing. IBM PC architecture : overview, introduction to DOS, Advanced microprocessors.

4. Measurement and Instrumentation : Error analysis; measurement of current voltage, power, energy, power-factor, resistance, inductance, capacitance and frequency; bridge measurement. Electronic measuring instruments : multimeter, CRO, digital voltmeter, frequency counter, Q-meter, spectrum-analyser, distortion-meter. Transducers : thermocouple, thermistor, LVDT, strain-guage, piezoelectric crystal. Use of transducers in measurements of non-electrical quantities. Data-acquisition systems.

5. IC Technology : Overview of IC Technology. Unit-steps used in IC fabrication : wafer cleaning, photo-lithography, wet and dry etching, oxidation, diffusion, ion-implantation, CVD and LPCVD techniques for deposition of poly-silicon, silicon, silicon-nitride and silicon dioxide; metallisation and passivation.

6. 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; SCAD A systems and RTUs. Active power control : Speed control of generators, tie-line control, frequency control. Economic dispatch

7. Power system protection : Principles of over current, differential and distance protection. Concept of solid stale relays. Circuit brakers. Computer aided protection : Introduction; line bus, generator, transformer protection; numeric relays and application of DSP to protection.

8. Non-conventional Energy Sources and Energy Management : Introduction to the energy problem; difficulties with conventional energy sources. Wind-Energy : Basics of Wind turbine aerodynamics; 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, payback period, internal rate of return, life cycle costing.

9. Digital Communication : Pulse code modulation (PCM), deferential 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-laycr architecture.

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

11. 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:

English Literature - OPTIONAL

Of part - B- Main Examination of Civil Services Exam

PAPER I

Answers must be written in English.

Texts of detailed study are listed below. Candidates will also be required to show adequate knowledge of the following topics and movements :

The Renaissance : Elizabethan and Jacobean Drama; Metaphysical Poetry; The Epic and the Mock-epic; Neo-classicism; Satire; The Romantic Movement; The Rise of the Novel; The Victorian Age.

SECTION-A

1. William Shakespeare : King Lear and The Tempest.
2. John Donne. The following poems :
   Canonization, Death be not proud, The Good Morrow, On his Mistress going to bed, The Relic,
3. John Milton : Paradise Lost, I, II, IV, IX
4. Alexander Pope. The Rape of the Lock.
5. William Wordsworth. The following poems:

   Ode on Intimations of Immortality, Tintern Abbey, Three years she grew, She dwelt among untrodden ways, Michael, Resolution and Independence, The World is too much with us, Milton, thou shouldst be living at this hour, Upon Westminster Bridge.

6. Alfred Tennyson : In Memoriam.
7. Henrik Ibsen : A Doll's House.

SECTION-B

1.Jonathan Swift. Gulliver's Travels.
2. Jane Austen. Pride and Prejudice.
3. Henry-Fielding. Tom Jones.
4. Charles Dickens. Hard Times.
5. George Eliot. The Mill on the Floss.
6. Thomas Hardy. Tess of the d'Urbervilles.
7. Mark Twain. The Adventures of Huckleberry Finn.

PAPER-II

Answers must be written in English.

Texts for detailed study are listed below. Candidates will also be required to show adequate knowledge of the following topics and movements :

Modernism; Poets of the Thirties; The stream-of-consciousness Novel; Absurd Drama; Coionialism and Post-Colonialism; Indian Writing in English; Marxist, Psychoanalytical and Feminist approaches to literature; Post-Modernism.

SECTION-A

1. William Butler Yeats. The following poems:

Easter 1916, The Second Coming, A Prayer for my daughter, Sailing to Byzantium, The Tower, Among School Children, Leda and the Swan, Menu, Lapis Lazuli, The Second Coming, Byzantium.

2. T.S. Eliot. The following poems :

The Love Song of J. Alfred Prufrock, Journey of the Magi, Burnt Norton.

3. W.H. Auden. The following poems :

Partition, Musee des Beaux Arts, In Memory of W.B. Yeats, Lay your sleeping head, my love, The Unknown Citizen, Consider, Mundus Et Infans, The Shield of Achilles, September 1,1939, Petition.

4. John Osborne: Look Back in Anger.
5. Samuel Beckett. Waiting for Godot.
6. Philip Larkin. The following poems: -
   Next, Please, Deceptions, Afternoons, Days, Mr. Bleaney.

7. A.K. Ramanujan. The following poems:

Looking for a Cousin on a Swing, A River, Of Mothers, among other Things, Love Poem for a Wife 1, Small-Scale Reflections on a Great House, Obituary

(All these poems are available in the anthology Ten Twentieth Century Indian Poets, edited by R. Parthasarthy, published by Oxford University Press, New Delhi).

SECTION-B

1. Joseph Conrad. Lord Jim
2. James Joyce. Portrait of the Artist as a Young Man.
3. D.H. Lawrence. Sons and Lovers.
4. E.M. Forster. A Passage to India.
5. Virginia Woolf. Mrs Dalloway.
6. Raja Rao. Kanthapura.
7. V.S. Naipaul. A House for Mr. Biswas.

GARO - OPTIONAL

of Part - B - Main Examination of Civil Services Exam

PAPER-I

1. Traditional Poetry

1. Mande aro Chatchi De'a
2. Dimrimbri Palwang A'dingko Katchini Anti kaa
3. Jumang Matpu Nika
4. Gongani Kilbolma Supea
5. Churugala aro Sasat So'a
6. Dakgipa Rabuga
7. Sambolrangni Chachenga
8. Wangala
9. Matdoka ba Matchu Den'a
10. Sa'rao Krita

2. Modern Poetry

1. Mikjumang A'gilsak – Jonmni D. Shira
2. Angni Gisik – Couplane G.Momin
3. Matgrik Mi'am Sepi Gitcham – Johindra Ch. Marak
4. Ketket Rim'bo – K.D. Shira
5. Chengoni Manderang – M.R.Sangma
6. O A'chik Song – Evelyn R.Marak
7. Bilsi Gital – H.D.W.Momin
8. Do'kua – Tuniram R. Marak
9. Basako? – Jonmoni D. Shira
10. Sigimin Ripengko gisik ra'ani – K.R.Marak
11. Gitanjali (Translated) – H.W.Marak
12. Anga Bebera'a
13. Gitelni Boja
14. Gunni Gopram
15. Rong Gri Mande
16. Salgi Chil'engsa
17. Simteka Gri Gitrang

Ku'bisring – I B.K. Sangma

18. Tom'tomani Nabaon
19. Ma'ani Bi'ani
20. Balwarang Ku'misia
21. Golap Gitchak Balsa
22. San' Jaksi Chikani

Ku'bisring – II - B.K.Sangma

23. Dingchik Gun
24. Chadambeni Gisik
25. Aman' Kusik
26. Kakket
27. Jotton Ka'an Rama

Ku'mande Ku'jaleng - M.K.Marak

3. Rhetoric and prosody

Rhetoric and prosody- V.S.B.Sangma

4. Proverbs & Phrases and Essay

1. Aganme'apa- M.S.Sangma & J.L.R.Marak
2. A'chik Compostion – K.M.Momin
3. A'chik kattarang – W.K.Sangma
4. A'chik Golporang I, II & III-D.K.Sangma

5. Grammar

1. A'chik Grammar – E.G. Phillips

6. Comprehension & Precis Writing & Essay

7. Garo Literary Criticism

1. Literary Critisim – L.D.Shira
2. Sea Jotani Nama Namgijako See Parakatani A'bachenggipa Bewalrang (Elements of Literary Critisim) - M.S. Sangma

8. Oral Narratives

Apasong Agana – D.S.Rongmuthu

1. A'ko Doka Chiko Gina
2. Gittingko Ba'ani
3.Misini Dedrang A'ningni Dedrangko Gro Dinga
4. Mandeni sichenga
5. Susimemani Siani Salo
6. Banggria
7. Wa'alko Ba'a
8. Do'mani Grapa
9. Miko Man'chengani
10. A'ba o'e game Cha'chengani
11. Muniko Man'chenga
12. Marangni Atchia
13. Bisiko Man'chenga
14. Silchiko Man'chenga
15. Danilko Man'chengani
16. Wangalako dakchengani

A'chikni Ku'andik – A.Ch.Momin

1. Man'e Chagipa Manderangni Manianirang Gipin Manianirang aro Dakbewalrang

A'chik Golporang Bak-I

1. Chipu Na'kadok
2. Do'uang
3. Do'kuamung Mese
4. Do'po Deba'a
5. Do'de Gitok
6. Kawatte Ku'dikgila
7. Peru Am'pak Kika
8. Nokmana Bisi Tikja
9. Mat An'chi Pila
10. Mongma aro Okgipu

Paper-II

1. Traditional Drama

1. Dikki part-1- L.R.Sangma
2. Dikki part-II - L.R.Sangma

2. Modern Drama

1. Skul Master – L.D. Shira
2. Nokdang – K.M.Momin
3. Macbeth (Adaptation) – K.R.Marak
4. Metongbolni Gittim- L.R.Marak

3. Prose

1. Maniani Bidik – Mihir N.Sangma
2. Katta Wal'tim – Kroshnil D.Sangma
3. A'chikni Ma'biding-Moniram Marak

4. Fiction

1. Dombe Rani – A.R.Sangma
2. An'chichi bregimin – L.M.Holbrook
3. Shakespeareni Golporang – W.K.Marak
4. Gamseng – I.R. Marak
5. Dugalgreni Me'chik- B.Ch. Sangma

5. **History of Garo Language**

1. A'chikkuni Ma'ambi- M.S.Sangma, Chapter I upto VI

6. History of Garo Literature

1. History of Garo Literature Chapter-I upto 8 – M.S.Sangma
2. Gisik Matgrikrang- L.D.Shira

Geography – Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

Principles of Geography

Section-A

Physical Geography

1. Geomorphology : Factors controlling landform development; endogenetic and exogenetic forces; origin and evolution of the earth's crust; physical conditions of the earth's interior; geosynclines; continental drift; isostasy; sea-floor spreading; plate tectonics; mountain building; volcanicity; earthquakes; concepts of geomorphic cycles; landforms associated with fluvial, arid, glacial, coastal and karst cycle; groundwater; Applied Geomorphology. Economic geology and environment.

2. **Climatology** : Temperature and pleasure belts of the world. Heat budget of the earth. Atmospheric circulation, Atmospheric stability and instability Planetary and local winds, Monsoons and jet streams, Air masses and fronto, temparate and tropical cyclones, Types and distributions of precipitation, weather and climate; Koppen Thornthwaite and Trewar Tha's classifications of world climate, Hydrological cycle, Global climatic change, and role and response of man in climatic changes Applied climatology and Urban climate.

3. **Oceanography** : Bottom topography, of the Atlantic, Indian and Pacific Oceans; temperature and salinity of the oceans; ocean deposits; ocean currents and tides; marine resources, biotic, mineral and energy resources; coral reefs; sea-level changes.

4. **Biogeography** : Genesis of soils; classification and distribution of soils; soil profile; soil erosion and conservation; factors influencing world distribution of plants and animals; problems of deforestation and conservation measures; social forestry, agro-forestry. Wild life, Major gene pool centres.

5. **Environmental Geography** : Human ecological adaptations; transformation of nature by man; environmental' degradation and conservation; ecosystems and their management; global ecological imbalances-problems of pollution, global warming, reduction in bio-diversity and depletion of forests. Ecosystem their management and conservation, Environmental degradation, management and conservation, Biodiversity and sustainable development, Environmental policy, Environmental hazards and remedial measures, Environmental education and legislation.

Section-B

Human Geography

6. **Perspectives in Human Geography** : Areal differentiation; regional synthesis; dichotomy and dualism; environmentalism; quantitative revolution and locational analysis; radical, behavioural, human and welfare approaches; cultural regions of the world, cultural regions of the world; human development indicators.

7. **Economic Geography** : World economic development-measurement and problems; world resources and their distribution; energy crisis; the limits to growth; world agriculture, typology of agricultural regions; agricultural inputs and productivity; food and nutrition problems; famine-causes, effects and remedies; world industries-location patterns and problems; patterns of world trade.

8. **Population and Settlement Geography** : Growth and distribution of world population; demographic attributes; causes and consequences of migration; concepts of over- under- and optimum population; world population problems.

Types and patterns of rural settlements; hierarchy of urban settlements; concept of primate city and rank-size rule; functional classification of towns; sphere of urban influence; rural-urban fringe; satellite towns, problems of urbanization.

9. **Regional Planning** : Concept of a region; types of regions and methods of regionalization; growth centres and growth poles; regional imbalances; environmental issues in regional planning; planning for sustainable development.

10. **Models, Theories and Laws in Human Geography** : System analysis in Human Geography; Malthusian, Marxian and Demographic Transition models; Central Place theories of Christaller and Losch; Von Thunen's model of agricultural location; Weber's model of industrial location; Rostov's model of stages of growth. Heart-land and Rim land theories; laws of international boundaries and frontiers.

Note : Candidates will be required to answer one compulsory map question pertinent to subjects covered by this paper.

Paper-II

Geography of India

Section-A.

1. **Physical Setting** : Space relationship of India with neighbouring countries; structure and relief; drainage system and watersheds; physiographic regions; mechanism of Indian monsoons; tropical cyclones and western disturbances; floods and droughts; climatic regions; natural vegetation, soil types and their distributions.

2. **Resources** : Land, surface and groundwater, energy, minerals, and biotic resources, their distribution, utilization and conservation; energy crisis.

3. **Agriculture** : Infrastructure-irrigation, seeds, fertilizers, power; institutional factors-land holdings, land tenure and land reforms; agricultural productivity, agricultural intensity, crop combination, land capability; agro-and social forestry; green revolution and its socio-economic and ecological implications; significance of dry farming; livestock resources and white revolution; blue revolution; agricultural regionalization; agro-climatic zones**,** agro-ecological regions.

4. **Industry** : Evolution of industries; locational factors of cotton, jute, iron and steel, fertiliser, paper, DRugs and pharmaceutical, automobile and cottage industries; industrial complexes and industrial regionalization; new industrial policy; multinationals and liberalization. Special economic Zones, Tourism including eco tourism.

5. **Transport**, Communication and Trade : Road, railway, waterway, airway and pipeline networks and their complementary roles in regional development; growing importance of ports on national and foreign trade, trade balance; free trade and export promotion zones; developments in communication technology and its impact on economy and society.

Section-B

6. **Cultural Setting :** Racial and ethnic diversities; major tribes, tribal areas and their problems; role of language, religion and tradition in the formation of cultural regions; growth, distribution and density of population; demographic attributes-sex-ratio, age structure, literacy rate, work-force, dependency ratio and longevity; migration (inter-regional, intra-regional and international) and associated problems, population problems and policies, health indicators.

7. **Settlements** : Types, patterns and morphology of rural settlements; urban development; census definition of urban areas; morphology of Indian cities; functional classification of Indian cities; conurbations and metropolitan regions; urban sprawl; slums and associated problems; town planning; problems of urbanization.

8. **Regional Development and Planning**: Experience of regional planning in India; Five Year Plans; integrated rural development programmes; panchayati raj and decentralized planning; common area development; watershed management; planning for backward area, desert drought-prone, hill and tribal area development; multi-level planning; geography and regional planning.

9. **Political Aspects** : Geographical basis of Indian federalism; state reorganization; regional consciousness and national integration; international boundary of India and related issues; disputes on sharing of water resources; India and geopolitics of the Indian Ocean.

10. **Contemporary Issues** : Environmental hazards-landslides, earthquakes, floods and droughts, epidemics; issues related to environmental pollution; changes in patterns of land use; principles of environmental impact assessment and environmental management; population explosion and food security, environmental degradation; problems of agrarian and industrial unrest; regional disparities in economic development; concept of sustainable growth and development, environmental awareness, linkages of rivers, globalization and Indian economy.

Note : Candidates will be required to answer one compulsory map question pertinent to subjects covered by this paper.

GEOLOGY - Optional

of Part B - Main Examination of Civil Services Exam

Paper-1

Section-A

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

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

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

Section-B

4. Paleontology : Species- definition and nomenclature. Mega fossils and Microfossils. Modes of preservation of fossils. Different kinds of microfossils. Application of microfossils in correlation, petroleum exploration, climatic and pale oceanographic studies. Morphology, geological history and evolutionary trend in Cephalopoda, Trilobita, Brachiopoda, Echinoidea and Anthozoa. Stratigraphic utility of Ammonoudea, Trilobita and Graptoloidea. Evolutionary trend in Hominidae, Equidae and Proboscidae. Siwalik fauna. Gondwana flora and its importance.

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

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

Paper-II

Section-A

1. Mineralogy : Classification of crystals into systems and classes of symmetry. International system of crystallographic notation. Use of projection diagrams to represent crystal symmetry. Crystal defects. Elements of X-ray-crystallography. Petrological microscope and accessories. Optical properties of common rock forming minerals. Pleochroism, extinction angle, double refraction, birefringence, twinning and dispersion in minerals. Physical and chemical characters of rock forming silicate mineral groups. Structural classification of silicates. Common minerals of igneous and metamorphic rocks. Minerals of the carbonate, phosphate, sulphide and halide groups. Optical properties of common rock forming minerals, Pleochroism, extinction angle, double refraction, birefringence, twinning and dispersion in minerals.

2. Igneous ad Metamorphic Petrology : Generation and crystallisation of magma. Crystallisation of albite-anorthite, diopside-anorthite and diopside-wollastonite-silica systems. Reaction principle., Magmatic differentiation and assimilation. Petrogenetic significance of the textures and structures of igneous rocks. Petrography and petrogenesis of granite, syenite, diorite, basic and ultrabasic groups, charnockite, anorthosite and alkaline rocks. Carbonatites. Deccan volcanic province.

Types and agents of metamorphism. Metamorphic grades and zones. Phase rule. Facies of regional and contact metamorphism. ACF and AKF diagrams. Textures and structures of metamorphic rocks. Metamorphism of arenaceous, argillaceous and basic rocks. Minerals assemblages Retrograde metamorphism. Metasomatism and granitisation, migmatites, Granulite terrains of India.

3. Sedimentology : Sedimentary rocks: Processes of formation, digenesis and lithification. Properties of sediments. Clastic and non-clastic rocks-their classification, petrography and depositional environment. Sedimentary facies and provenance. Sedimentary structures and their significance. Heavy minerals and their significance. Sedimentary basins of India.

Section-II

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

5. Mining Geology : Methods of prospecting-geological, geophysical, geochemical and geobotanical. Techniques of sampling. Estimation of reserves of ore. Methods of exploration and mining metallic ores, industrial minerals and marine mineral resources. Mineral beneficiation and ore dressing.

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

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

Hindi - Optional

of Part II - Main Examination of Civil Services Exam

Paper-I

Answers must be written in Hindi.

Section-A

1 . History of Hindi Language and Nagari Lipi.
1. Grammatical and applied forms of Apbhransh, Awahatta & Arambhik Hindi.
II. Development of Braj and Awadhi as Literary language during medieval period.
III. Early form of Khari-boli in Siddha-Nath Sahitya. Khusero. Sant Sahitaya. Rahim etc. and Dakhni Hindi.
IV. Development of Khari-boli and Nagari Lipi during 19th Century.
V. Standardisation of Hindi Bhasha *&* Nagari Lipi
VI. Development of Hindi as National Language during freedom movement.
VII. The development of Hindi as a National Language of Union of India.
VIII. Scientific *&* Technical Development of Hindi Language.
IX. Prominent dialects of Hindi and their inter-relationship,
X. Salient features of Nagari Lipi and the efforts for its reform & Standard form of Hindi.
XI. Grammatical structure of Standard Hindi.

Section-B

2. History of Hindi Literature.

2.I. The relevance and importance of Hindi literature and tradition of writing History of Hindi Literature.
2.2. Literary trends of the following four periods of history of Hindi Literature.

A : Adikal-Sidh, Nath and Raso Sahitya.

Prominent poets-Chandvardai, Khusaro. Hemchandra, Vidyapati.

B : Bhaktikal-Sant Kavyadhara, Sufi Kavyadhara, Krishna Bhaktidhara and Ram Bhaktidhara.

Prominent Poets-Kabir, Jayasi, Sur & Tulsi.

C : Ritikal-Ritikavya. Ritibaddhakavya & Riti Mukta Kavya.

Prominent Poets-Keshav, Bihari, Padmakar and Ghananand.

D : Adhunik Kal

a. Renaissance, the development of Prose, Bharatendu Mandal.
b. Prominent Writers : Bharatendu, Bal Krishna Bhatt & Pratap Narain Mishra.
c. Prominent trends of modern Hindi Poetry : Chhayavad, Pragativad, Prayogvad, Nai Kavita. Navgeet and Contemporary poetry and Janvadi Kavita.
d. Prominent Poets : Maithili Sharan Gupta, Prasad, Nirala, Mahadevi, Dinkar, Agyeya, Muktibodh, Nagarjun.

2.3. Katha Sahitya

A. Upanyas & Realism
B. The origin and development of Hindi Novels.
C. Prominent Novelists : Premchand, Jainendra, Yashpal, Renu and Bhism Sahani.
D. The origin and development of Hindi short story.
E. Prominent Short Story Writers : Premchand, Prasad, Agyeya, Mohan Rakesh & Krishna Sobti.

2.4. **Drama** *&* **Theatre**

A. The origin & Development of Hindi Drama.
B. Prominent Dramatists : Bharatendu, Prasad, Jagdish Chandra Mathur, Ram Kumar Verma, Mohan Rakesh.
C. The development of Hindi Theatre.

2.5. Criticism

A : The origin and development of Hindi criticism : Saiddhantik, Vyavharik, Pragativadi, Manovishleshanvadi & Nai Alochana.
B : Prominent critics : Ramchandra Shukla, Hajari Prasad Dwivedi, Ram Vilas Sharma & Nagendra.

2.6. The other forms of Hindi prose-Lalit Nibandh, Rekhachitra, Sansmaran, Yatra-vrittant.

Paper-II

Answers must be written in Hindi.

This paper will require first hand reading of prescribed texts and will test the critical ability of the candidates.

Section-A

1. Kabir : Kabir Granthawali, Ed, Shyam Sundar Das (First hundred Sakhis.)
2. Surdas : Bhramar Gitsar, Ed. Ramchandra Shukla (First hundred Padas)
3. Tulsidas : Ramcharit Manas (Sundar Kand) Kavitawali (Uttarkand).
4. Jayasi : Padmawat Ed. Shyam Sundar Das (Sinhal Dwip Khand & Nagmativiyog Khand)
5. Bihari : Bihari Ratnakar Ed. Jagnnath Prasad Ratnakar (First 100 Dohas)
6. Maithili Sharan Gupta : Bharat Bharati
7. Prasad : Kamayani (Chinta and Sharddha Sarg)
8. Nirala : Rag-Virag, Ed. Ram Vilas Sharma (Ram Ki Shakti Puja & Kukurmutta).
9. Dinkar: Kurushetra
10. Agyeya : Angan Ke Par Dwar (Asadhya Vina)
11. Muktiboth : Brahm Rakshahas
12. Nagarjun : Badal Ko Ghirte Dekha Hai, Akal Ke Bad, Harijan Gatha.

Section-B

1. Bharatendu : Bharat Durdasha
2. Mohan Rakesh : Ashad Ka Ek Din
3. Ramchandra Shukla : Chintamani (Part I) (Kavita Kya Hai] Shraddha Aur Bhakti)
4. Dr. Satyendra : Nibandh Nilaya-Bal Krishna Bhatt, Premchand, Gulab Rai, Hajari Prasad Dwivedi, Ram Vilas Sharma, Agyeya, Kuber Nath Rai.
5. Premchand : Godan, Premchand ki Sarvashreshtha Kahaniyan, Ed. Amrit Rai Manjusha
- Premchand ki Sarvashreshtha Kahaniyan, Ed. Amrit Rai
6. Prasad : Skandgupta
7. Yashpal : Divya
8. Phaniswar Nath Renu : Maila Anchal
9. Mannu Bhandari : Mahabhoj
10. Rajendra Yadav : Ek Dunia Samanantar (All Stories)

History - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

Section-A

1. ***Sources :*** Archaeological sources- Exploration, excavation epigraphy, numismatics, monuments, Literary sources - Indigenous- Primary and secondary, poetry, scientific literature, literature, literature in regional language, religious literature. Foreign account: Greek, Chinese and Arab writers.

2. **Pre-history and Proto-history :** Geographical factors – hunting and gathering (Paleolithic and Mesolithic). Beginning of agriculture (Neolithic and Chalcolithic)

3. **The Indus Civilization:** Its origins, nature and decline, survival and significance, art and architecture.

4. **Patterns of settlement**: Economy, social organization and religion in India (c. 2000 to 500 B.C.): archaeological perspectives.

5. **Evolution of North Indian society and culture:** Evidence of Vedic texts (Samhitas to Sutras).

6. Teachings of Mahavira and Buddha. Contemporary society. Early phase of state formation and urbanization.

7. **The Mauryan empire:** Ashoka's inscriptions; his dharma. Nature of the Mauryan state. Concept of Dharma, Edicts, Policy, Administration, Economy, Art, Architecture and sculpture, External contacts, Religion, Spread of religion, Literature.

8-9 **Post-Mauryan period in northern and peninsular India:** Political and administrative history. Society, economy, culture and religion. Tamilaham and its society: the Sangam texts.

10-11 **India in the Gupta and post-Gupta period (to c. 750) :** Political history of northern and peninsular India; **Samanta** system and changes in political structure; economy; social structure; culture; religion.

12. **Themes in early Indian cultural history:** Languages and texts; major stages in the evolution of art and architecture; major philosophical thinkers and schools; ideas in science and mathematics.

Section-B

13. **India, 750-1200 :** Polity, society and economy. Major dynasties and political structures in North India. "Indian Feudalism" rise of Rajputs. The Imperial Cholas and their contemporaries in Peninsular India. Village communities in the South. Conditions of women. Agrarian economy and urban settlements, Commerce mercantile groups and guilds; towns. Society, the status of the Brahman and the new social order, Indian science and technology. Problem of coinage. Arab conquest of Sind; the Ghaznavide empire.

14. **India, 750-1200:** Culture, Literature, Kalhana historian. Styles of temple architecture; sculpture. Religious thought and institutions: Skankaracharya and vedanta. Ramanuja, and Vishishtadvaita, Madhva and Brahma-Mimansa. Growth of Bhakti, Islam and its arrival in India. Sufism. Indian science. Alberuni and his study of Indian science and civilization..

15. **The 13th Century :** The Ghurian invasions. Factors behind Ghurian success. Economic, social and cultural consequences. Foundation of Delhi Sultanate. The "slave" Dynasty. Iltutmish; Balban. "The Khalji Revolution", Early Sultanate architecture,

16. The 14th Century: Alauddin Khalji's conquests, agrarian and economic measures. Muhammad Tughluq major projects. Firuz Tughluq's concessions and public works. Decline of the Sultanate. Foreign contacts: Ibn Battuta's ***account.***

17. **Economy Society and Culture in the 13th and 14th centuries:** Composition of rural society, ruling classes town dwellers, women, religious, classes. Caste and slavery under the sultanate. Technological changes. Sultanate architecture, Persian literature - Amir Khusrau, historiography, Ziya Barani. Evolution of a composite culture. Sufism in North India. Lingayats. Bhakti schools in the south. Agricultural Production, rise of urban economy and non-agricultural production, trade and commerce.

18. **The 15th and early 16th Century (Political History):** Rise of Provincial Dynasties: Bengal, Kashmir (Zainul Abedin), Gujarat, Malwa, Bahmanids. The Vijayanagara Empire. Lodis. Mughal Empire, First phase : Babur, Humayun. The Sur Empire - Sher Shah's administration. The Portuguese colonial enterprise.

19. **The 15th and early 16th Century (society, economy and culture):** Regional cultures and literatures, provincial architectural styles. Society, culture, literature and the arts in Vijayanagara Empire. Monotheistic movements - Kabir and Guru Nank. Bhakti Movements: Chaitanya. Sufism in its pantheistic phase.

20. **Akbar:** His conquests and consolidation of empire. Establishment-of jagir and mansab systems. His Rajput policy. Evolution of religious and social outlook. Theory of Sulh- i-kul and religious policy. Abul Fazl, thinker and historian. Court patronage of art and technology.

21. **Mughal empire in the 17th Century:** Major policies (administrative and religious) of Jahangir, Shahjahan and Aurangzeb. The Empire and the Zamindars. Nature of the Mughal State. Late 17th Century crisis: Revolts. The Ahom kingdom, Shivaji and the early Maratha kingdom.

22. **Economy and ,society in the 16th and 17th Centuries:** Population. Agricultural and craft production. Towns, commerce with Europe through Dutch, English and French companies a "trade revolution". Indian mercantile classes. Banking, insurance and credit systems. Conditions of peasants, famines. Condition of Women.

23. **Culture during Mughal Empire:** Persian literature (including historical works). Hindi and religious literatures. Mughal architecture. Mughal painting. Provincial schools of architecture and painting. Classical music. Science and technology. Sawai Jai Singh, astronomer. Mystic eclecticism : Dara Shukoh. Vaishnav Bhakti. Maharasthra Dharma. Evolution of the Sikh community (Khalsa).

24. **First half of 18th Century:** Factors behind decline of the Mughal Empire. The regional principalities (Nizam's Deccan, Bengal, Awadh). Rise of Maratha ascendancy under the Peshwas. The Maratha fiscal and financial system. Emergence of Afghan Power. Battle of Panipat, 1761. Internal weakness, political, cultural and economic, on eve of the British conquest.

Paper-II

Section-A

1. **Establishment of British rule in India:** Factors behind British success against Indian powers-Mysore, Maratha Con federacy and the Punjab as major powers in resistance; Policy of Subsidiary Alliance and Doctrine of Lapse.

2. **Colonial Economy :** Tribute system. Drain of wealth and "deindustrialization", Fiscal pressures and revenue settlements (Zamindari, Ryotwari and Mahalwari Settlements); Structure of the British raj up to 1857 (including the Acts of 1773 and 1784 and administrative organization).

3. Resistance to colonial rule : Early uprisings; Causes, nature and impact of the Revolt of 1857; Reorganization of the Raj, 1858 and after.

4. Socio-cultural impact of colonial rule: Official social reform measures (1828-57); Orientalist -Anglicist controversy; coming of English education and the press; Christian missionary activities in India; Bengal Renaissance; Social and religious reform movements in Bengal and other areas; Women as focus of social reform.

5. Economic Impact of British Colonial Rule: Land revenue settlements in British india, The Permanent Setlement, Ryotwari Setlement, Mahalwari Settlement, Economic impact of the revenue arrangements, commercialization of agriculture, rise of landless agrarian labourers.

Dislocation of traditional trade and commerce, Deindustrialisation, Decline of traditional crafts, Drain of wealth, Economic transformation of India, Railroad and communication network including telegraph and postal services, Famine and poverty in the rural interior.

6. Early Indian Nationalism: Social background; Formation of national associations; Peasant and tribal uprising during the early nationalist era; Foundation of the Indian National Congress; The Moderate phase of the Congress; Growth of Extremism; The Indian Council Act of 1909; Home Rule Movement; The Government of India Act of 1919.

7. Nationalism under Gandhi's leadership: Gandhi's career, thought and methods *of* mass mobilization; Rowlatt Satyagraha, Khilafat Movements, Non Cooperation Movement, Civil Disobedience Movement, 1940 Satyagraha and Quit India Movement; State People's Movement.

8. Other strands of the National Movement: (a) Revolutionary movements since 1905; (b) Constitutional politics; Swarajists, Liberals, Responsive Cooperation; (c) Ideas of Jawharlal Nehru, (d) The Left. (Socialists and Communists); (e) Subhas Chandra Bose and the Indian National Army; (f) Communal strands: Muslim League and Hindu Mahasabha; (g) Women in the National Movement.

9. Literary and cultural movements: Tagore, Premchand, Subrainanyam Bharati, Iqbal as examples only; New trends in art; Film industry; Writers' Organizations and Theatre Associations.

10. Towards Freedom: The Act of 1935; Congress Ministries, 1937-1939; The Pakistan Movement; Post-1945 upsurge (RIN Mutiny, Telangana uprising etc.,), Constitutional negotiations and the Transfer of Power, 15 August 1947.

11. First phase of Independence (1947-64): Facing the consequences of Partition; Gandhiji's murder; economic dislocation; Integration of States; The democratic constitution, 1950; Agrarian reforms; Building an industrial welfare state; Planning and industrialization; Foreign policy of Non-alignment; Relations with neighbours.

Section-B

12. Enlightenment and Modern ideas

1. Renaissance Background
2. Major Ideas of Enlightenment: Kant, Rousseau
3. Spread of Enlightenment outside Europe
4. Rise of socialist ideas (upto Marx)

13. Origins of Modern Politics

1. European States System
2. American Revolution and the Constitution.
3. French Revolution and Aftermath, 1789-1815.
4. British Democratic Politics, 1815-1850; Parliamentary Reformers, Free Traders, chartists.

14. Industrialization

1. English Industrial Revolution: Causes and Impact on Society
2. Industrialization in other countries: USA, Germany, Russia, *Japan*-
3. Socialist Industrialization: Soviet and Chinese.

15. Nation-State System

1. Rise of Nationalism in 19th century
2. Nationalism : State-building in Germany and Italy
3. Disintegration of Empires through the emergence of nationalities.

16. Imperialism and Colonialism

1. Colonial System (Exploitation of New World, Trans-Atlantic Slave Trade, Tribute from Asian Conquests)
2. Types of Empire: of settlement and non-settlement: Latin America, South Africa, Indonesia, Australia.
3. Imperialism and Free Trade: The New Imperialism

17. Revolution and Counter-Revolution

1. 19th Century European revolutions
2. The Russian Revolution of 1917-1921
3. Fascist Counter-Revolution, Italy and Germany.
4. The Chinese Revolution *of* 1949

18. World Wars

1. 1st and 2nd World Wars as Total Wars: Societal Implications
2. World War I : Causes and Consequences
3. World War II : Political Consequence

19. Cold War

1. Emergence of Two Power Blocs
2. Integration of West Europe and US Strategy; Communist East Europe
3. Emergence of Third World and Non-Alignment
4. UN and Dispute Resolution

20. Colonial Liberation

1. Latin America-Bolivar
2. Arab World-Egypt
3. Africa-Apartheid to Democracy
4. South-East Asia-Vietnam

21. Decolonization and Underdevelopment

1. Decolonization: Break up of colonial Empires: British, French, Duth
2. Factors constraining Development : Latin America, Africa

22. Unification of Europe

1. Post War Foundations : NATO and European Community
2. Consolidation and Expansion of European Community/European Union.

23. Soviet Disintegration and the Unipolar World

1. Factors in the collapse of Soviet Communism and the Soviet Union, 1985-1991
2. Political Changes in East Europe 1989-2001
3. End of the Cold War and US Ascendancy in the World
4. Globalization

Khasi – OPTIONAL

of Part - B - Main Examination of Civil Services Exam

Paper I

1. Khasi Poetry:

1. Soso Tham (1936): "U John Gilpin" from Ka Duitara Ksiar
2. Morkha Joseph (1967) :"Ka Jingiam Briew ha u Lum Jingtep Ingmane" from Ka Ryngkap
3. Enami (1911) : "I Thakemon" from Na ka Thiar ki Longshuwa
4. Soso Tham (1936): "Ki Sngi Barim U Hynniew Trep" from Ka Duitara Ksiar
5. D.S.Khongdup (1968): (a) 'U Syntiew ba nga jied" from Na Lum Khasi
6. H.W.Sten (1980): Ka Burom ba la jah II
7. O.M.Wahlang (1986): (a) "Ka Sohlyngngem" from Ka Jutang Sur Pangnud U khun Khasi
8. Rabon Singh (16th Edition Reprint 1987): (a) "Ka Jingphawar Shadwait" (b) "Ka Jingphawar Iasiat Thong" from Ka Kitap Jingphawar
9. V.G.Bareh (1998 Reprint) : (a) "Ka Duitara Jong Nga" from Ki Poetry Khasi

2. Khasi Drama:

1. D.S.Khongdup (1968): U Baieit Donshkor
2. H.Mylliemngap (1980): Ka Rangli
3. H.W.Sten (1983): Ka Mahadei
4. S.Dkhar (2001): U Raikut
5. S.J.Duncam (1978) : U Androklis bad u Sing

3. Khasi Fiction:

1. John Roberts (1910): Ka Jingiad u Pilgrim
2. W. Tiewsoh (1975) : Kam Kalbut
3. F.S.Lyngdoh (1989):Ka Jingieit Ba Nylla
4. H.W.Sten (1981) : Ka Samla Nongkyndong

Paper II

1. Khasi Culture:

1. Feebon Roy (1897): "Shaphang ka Jingiapoikha" Lynnong II from Ka Niam jong ki Khasi
2. G.Costa (1937) :"Ka Bishar Khasi" from Ka Riti Jong Ka Ri Laiphew Syiem Bynta II
3. H.Lyngdoh (1937): " Ki Mawbynna" "Ki Jait Syiem jait Lyngdoh" from Ka Niam Khasi
4. H.O.Mawrie (1973): "U Khasi bad ki Khanatang 1,11,111", chapter 17,18,19 from Ka Pyrkhat u Khasi
5. D.T.Laloo (1978): "Ka Tynrai ka Ksaw ka Kpong" from Ka Ksaw Ka Kpong U Hynniew Trep

2. Khasi Literary Criticism:

1. D.R.L.Nglait (2005): "Ka Pyrla halor ka Jingbishar Bniah" from KaThew ka woh ia ka Jingbishar Bniah Halor ka Novel Khasi (pages 1 – 5, pages 17 – 33)
2. H.W. Sten (1982): Shaphang ka Novel
3. H.Elias (1963): "Shaphang ka poitri" from Ka Hamsaia ki Por
4. F.M.Pugh (1968): "Ha ki nongpule" from Ka Sawangka ia ki Sawngut Ba iap Mynsaw

3. Khasi Linguistics

(a) Ka jingroi jingsan ka Drama Khasi naduh u H.C.Roy (1910) haduh u H.Mylliemngap (1980);
(b) Ka Jingroi jingsan ka Poitri Khasi naduh u Soso Tham (1925) haduh u H.W.Sten (1980)
(c) Ka Jingroi jingsan ka Parom (fiction) Khasi naduh u H.C. Roy (1915) haduh u L.H.Pde (1980);
(d) Ka Jingroi Jingsan ka Prose Khasi naduh u Jeebon Roy (1900-1980)

Note: This paper focuses on the kind of development and the factors responsible for such developments.It also studies the major issues dealt by Khasi authors. Besides, it examines the literary standard and value of different works of Literature during the period.

Khasi language study.

1. H.Marwein (1990) : Ki verb Khasi Chap.I – Ka Verb, Chap. II – Ki Jait Verb
2. H.W.Sten (1991) : Shaphang Ka Ktien
Chap. III – Jingspel Dak, Chap. IV – Pyniakhlad Kyntien,,Chap. VI – Shynrong Klas, Chap. IX – Shynrong Klos.
3. M.B.Jyrwa (1995): Ka jingpule Shaphang Ka Ktien
Chap.V – Ka Aspek
4. B.War (2009): Ki Sawa bad ki Dur Kyntien jong ka Ktien Khasi

LAW - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

Section-A

1. Consitutional Law of India

1. Nature of the Indian Constitution **:** The distinctive features of its federal character.
2. Fundamental Rights.
3. Relationship between Fundamental Rights. Directive Principles and Fundamental Duties.
4. Constitutional Position of the President and relation with the Council of Ministers.
5. Governor and his Powers.
6. Appointment and Transfer of Judges of the Supreme Court and the High Courts.
7. Supreme Court and High Courts: Powers and Jurisdiction.
8. Union Public Service Commission and State Public Service Commissions: Powers and Functions.
9. Distribution of Legislative Powers between the Union and the States.,
10. Administrative Relationship between Union and the States.
11. Emergency Provisions
12. Civil Servants: Constitutional safeguards.
13. Parliamentary Privileges
14. Amendment of the Constitution.
15. Principle of Natural Justice
16. Delegated Legislation: Its constitutionality and judicial and legislative controls.
17. Judicial Review of Administrative Action.
18. Ombudsman **:** Lokayukta Lokpal etc.

Section - B

2. International Law

1. Nature and Definition of International Law.
2. Relationship between International Law and Municipal Law
3. State Recognition and State Succession.
4. Law of the Sea: Inland Waters, Territorial Sea, Contiguous Zone, Continental Shelf, Exclusive Economic Zone and High Seas.
5. Individuals , nationality, statclcssncss; Human Rights and procedures available for their enforcement.
6. Territorial jurisdiction of States, Extradition and Asylum.
7. Treaties: Formation application, termination and reservation.
8. United Nations: Its principal organs, powers, and functions.
9. Settlement of Distputes.
10. Lawful recourse to force: aggressions, self-defence, intervention.
11. Legality of the use of nuclear weapons; ban on testing of nuclear weapons; Nuclear non proliferation treaty, CTBT.
12. International Terriorism State sponsored terrorism. Hijacking, International Criminal Court.

13. New International Economic order, and Monetary law: WTO. TRIPS, GAIT, IMF, World Bank.
14. Protection and Improvement of the Human Environment: International Efforts.
15. Fundamental principles of international humanitarian law – International conventions and contemporary developments.

Paper-II

Section-A

1. Law of Crimes:-

1. General Principles of Criminal Liability: mens rea and actus rcus, Mcns rca in statutory offences.
2. Application of the Indian Penal Code.
3. Kinds of Punishment.
4. Preparations and criminal attempts
5. General exceptions.
6. Joint and constructive liability.
7. Abetment.
8. Criminal conspiracy.
9. Offences against the State.
10. Offences against public tranqulity.
11. Offences against human body.
12. Offences against properly
13. Offences Relating to Marriage.
14. Defamation
15. Protection of Civil Rights Act, 1955
16. Dowry Prohibition Act. 1961
17. Prevention of Corruption Act. 1988.
18. Plea bargaining

2. **Law of Torts** :

1. Nature and definition.
2. Liability based upon fault and strict liability
3. Vicarious liability including State Liability.
4. General defences.
5. Joint tort feasors.
6. Remedies.
7. Negligence
8. Defamation.
9. Nuisance.
10. Conspiracy
11. False imprisonment.
12. Malicious Prosecution.
13. Consumer Protection Act, 1986.

Section-B

3. Law of Contracts and Mercantile Law

I. Formation-of Contract/ E-contract
2. Factors vitiating consent
3. Void voidable, illegal and unenforceable agreements.
4. Performance and discharge of contracts.
5. Quasi-contracts.
6. Consequences of breach of contract
7. Contract of indemnity, guarantee and insurance.
8. Contract of Agency.
9. Sale of goods and hire purchase.
10. Formation and dissolution of partnership
11. Negotiable Instruments Act. 1881.
12. Arbitration and Conciliation Act. 1996.
13. Standard form contracts.

4. Contemporary Legal Developments

1. Public Interest Litigation.
2. Intellectual property rights-Concepts, types/prospects.
3. Information Technology Law including Cyber Laws-concepts, purpose/prospects.
4. Alternate Dispute Resolution-Concept, types/prospects.
5. Major statutes concerning environmental law.
6. Right to Information Act.
7. Trial by media.

Management -Optional

of Part - B - Main Examination of Civil Services Exam

Paper I

The candidate should make a study of the concept and development of management as science and art drawing upon the contributions of leading thinkers of management and apply the concepts to the real life of government and business decision making keeping in view the changes in the strategic and operative environment.

Section-A

1. Managerial Function : Concept and foundations of Management, Managerial role and funclions. Analysis of Environmental opportunities and threats. Formulation of Organisational Vision, Mission and Objectives. Decision Making.

2. Organisational Behaviour and Design : Classical and Neoclassical Systems. Delegation of Authority, Design of Strategic Business Units. Theories of motivation and their relevance. Communication. Leadership. Understanding group behaviour and dynamics. Conflict Management. Managing Change. Innovation in Organizational Design such as Networks, Knowledge Based Enterprises-Systems and Processes.

3. Quantitative Techniques in Decision Making : Classification of data, Averages, Dispersion and Skwness. Correlation and Regression. Time- Scries Analysis & Forecasting Techniques. Elementary concepts of Binomial, Poisson and Normal Distributions. Tests of Significance 't', 'F' and Chisquare. Linerar Programming Problem formulation-Simplex method and Graphical solution. PERT and CPM. Decision making under uncertainity. Linear programming – problem formulation, simpex method and graphical solution, sensitivity analysis.

4. **Accounting for Managers :** Financial accounting- concept, importance and scope, generally accepted accounting principles, preparation of financial statements with special reference to analysis of a balance sheet and measurement of business invome, inventory valuation and depreciation, financial statement analysis, fund flow analysis, the statement of cash flows – Management accounting concept, need, importance and scope – Cost accounting – records and processes, cost ledger and control accounts, reconciliation and integration between financial and cost accounts – Overhead cost and control, Job and process costing, Budget and budgetary control, Performance budgeting, Zero base budgeting, relevant costing and costing for decision – making, standard costing and variance analysis, marginal costing and absorption costing.

Section-B

5. Management Control System : Basic concepts. Understanding strategic behaviour. Responsibility Centres, Strategic Planning. Preparation of budgets, Zero Based Budget, Analysis and Evaluation of Performance, Control System in Service Organization. Modern Control Methods, Controlling Global Enterprises: Transfer Pricing and Management of Risk.

6. **Strategic Cost Management** : Value Chain : Conceptual issues and Applications. Cost analysis-Activity based costing, Cost Drivers and their measurement. Target Costing. Profit Variance Analysis.

7. Business Environment : Concept and Analysis of Macro-business environment: Indian and global. Analysis of structural dimensions of Indian Economy.-Directions of change and impact on business decision. Regulatory and promotional Policies. Liberalization, Globalisation and Corporatisation Problems and Prospects.,

Paper-II

Section-A

1. **Financial Management** : Goal of Finance Function. Analysis of Financial Postion: Ratio and Funds Flow Analysis. Concepts of value and return. Valuation of Bonds and Shares. Risk and Return: Portfolio Theory, CAPM, APT and APM. Option Pricing. Financial and Operating leaverage. Design of Capital Structure; Theories and Practices. Management of Working Capital: Estimation and Financing. Management of Cash Receivables and Inventory and Current Liabilities. Capital and Money Markets: Institutions and Instruments. Leasing hire purchase and Venture capital mergers and acquistions. Shareholder Value Creation: Dividend Policy, Corporate financial policy and strategy. Management of corporate distress and restructuring strategy. Regulation of capital market. Financial derivatives – option futures swap. Recent reforms in financial sector.

2. Marketing Management : Concept and strategy. Analysis of marketing environment and planning process. Understanding and selecting target markets, positioning and differentiating the market offering, analysing competition, analysing consumer market, industrial buyer behaviour. Marketing Research. Consumer Behaviour. Segmentation, Targeting and Positioning.. Product management. Distribution channels and logistics. Public Distribution System. Marketing Communciation. Brand Management, personal selling and management of salesforce. Pricing decisions. Understanding competitive strategy. Design, implementation and control. Services and non-profit marketing. Social Marketing. Creating global competitive Advantage: Analysis, formulation, implementation and control. Evaluation of marketing function. Ethics-in marketing: Consumer protection. E-Business, internet marketing, retail management, customer relationship management, concept of holistic marketing.

3. International Business : International Business Environment: Changing composition of trade in goods and services. Emerging areas of trade. Evaluation of International Trade Policies-instruments of trade policy, institutions of international business GATT//WTO, Trims and Trips-Labour conditions and environmental issues, trade in services and agri products, role of IMF", World Bank. UNCTA1). Regional Economic Cooperation. Export Marketing Management-Overseas market research, Export pricing and finance. Management of risk. Export-import procedures. Tole of intermediaries and documentation.

Section-B

4. Operation and Materials Management : Fundamentals of Operations Management. Organising for Production. Aggregate Production Planning, Capacity Planning, Plan Design: Process planning plant size and scale of operations. Management of facilities. Equipment replacement and maintenance. Production cotnrol. Supply Chain Management-Vendor Evaluation and Audit Quality Management.

Role and importance of Materials Management , Material Handling, Value Analysis. Quality control, Make or Buy Decision. Codification. Standardisation of spare parts inventory. Inventory Control. Two Bin System. Waste Management, Purchasing process and procedure. International Buying.

5. **Management Information** System : Conceptual foundations of Information System, information Resource Management. System Development-Overview of Systems and Design. System Development Management life-cycle, Designing on-line and Distributed environments. Implementation and Control of Project, fiends in Information Technology. Managing Data Resources-Organising Data. DSS and RDBMS.

6. Human Resource Development ; Concept and Policies. Man-power planning; recruitment. Selection, trainging, development, promotion and transfer. Performance Management-job evaluation, job enrichment. Compensation Management. Employee Morale and Productivity. Management of Organisational Climate and Industrial Relations. Humans Resource Accouting and Audit.

Mathematics - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

Section-A

1. Linear Algebra : Vector, spaces, linear dependence and independence, subspaces, bases, dimensions. Finite dimensional vector spaces. Matrices, Cayley-Hamilton theorem, eigenvalues and eigenvectors, matrix of linear transformation, row and column reduction. Echelon form, equivalence. congruences and similarity, reduction to cannonical form, rank, orthogonal, symmetric, skew-symmetric, unitary, bermitian, skew-hermitian forms-their eigenvalues. Orthogonal and unitary reduction of quadratic and hermitian forms, positive definite quadratic forms.

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

3. Analytic Geometry : Cartesian and polar coordinates in two and three dimensions, second degree equations in two and three variables reduction to Canonical forms, straight lines, shortest distance between two skew lines, Plane, sphere, cone, cylinder., paraboloid, ellipsoid, hyperboloid of one and two sheets and their properties.

Section-B

4. Ordinary Differential Equations : Formulation of differential equations, order and degree, Equations of first order and first degree, integrating factor, equations of first order but not of first degree, Clarrant's equation, singular solution.

Higher order liner equations with constant coefficients, complementary function and particular integral, general solution, Euler-Cauchy equation.

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

Laplace and Inverse Laplace transforms and their properties, Laplace transforms of elementary functions. Application to initial value problems for 2^{nd} other linear equations with constant coefficients.

5. Dynamics, Statics and Hydrostatics :Degree of freedom and constraints, rectilinear motion, simple harmonic motion, motion in a plane, projectiles, Constrained motion; Work and energy, conservation of energy, motion under impulsive forces, Kepler's laws, orbits under central forces, motion of varying mass, motion under resistance.

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

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

6. Vector Analysis : Scalar and vector fields, triple, products, differentiation of vector function of a scalar variable, Gradient, divergence and curl in cartesian, cylindrical and spherical coordinates and their physical interpretations. Higher order derivatives, vector identities and vector equations.

Application to Geometry: Curves in space, curvature and torsion. Serret -Furenet’s formulae, Gauss and Stokes' theorems, Green's indentities.

Paper-II

Section-A

1. Algebra : Groups, subgroups, normal subgroups, homomorphism of groups, quotient groups, basic isomorphism theorems, Sylow's group-, permutation groups, Cayleys theorem. Rings and ideals, principal ideal domains, unique factorization domains and Euclidean domains. Field extensions, finite fields.

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

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

4. Linear Programming : Linear programming problem, basic solution, basic feasible solution and optimal solution, graphical method and simplex method of solutions. Duality.

Transportation and assignment problems. Travelling salesman problems.

Section-B

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

6. Numerical Analysis and Computer programming: Numerical methods: Solution of algebraic and transcendental equations of one variable by bisection, Regula-Falsi and Newton-Raphson methods, solution of system of linear equations by Gaussian elimination and Gauss-Jordan (direct) methods, Gauss-Seidel(iterative) methods. Newton's (forward and backward) and Lagrange's method of interpolation.

Numerical integration: Simpson's one-third rule, tranpezodial rule, Gaussian quardrature formula. Numerical solution of ordinary differential equations: Euler and Runge Kutta-methods.

Computer Programming: Storage of numbers in computers, bits, bytes and words, binary system, arithmetic and logical operations on numbers. Bitwise operations. AND, OR , XOR, NOT, and shift/rotate operators. Octal and Hexadecimal Systems. Conversion to and from decimal Systems. Algebra of binary numbers. Elements of Computer systems and concept of memory, basic logic gates and truth tables, Boolean algebra, normal forms.

Representation of unsigned integers, signed integers and reals, double precision reals and long integers. Algorithms and flow charts for solving numerical analysis problems.

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

7. Mechanics.and Fluid Dynamics :

Generalised coordinates, constraints, holonomic and non-holonomic , systems. D' Alembert's principle and Lagrange' equations, Hamilton equations, moment of intertia, motion of rigid bodies in two dimensions.

Equation of continuity, Euler's equation of motion for inviscid flow, Stream-lines, path of a particle, potential flow, two-dimensional and axisymmetric motion, sources and sinks, vortex motion, flow past a cylinder and a sphere, method of images. Navier-Stokes equation for a viscous fluid.

Mechanical Engineering - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

1. Theory of Machines : Kinematic and dynamic analysis of planar mechanisms. Cams, Gears and gear trains, flywheels, governors, balancing of rigid rotors, balancing of single and multicylinder engines, Linear vibration analysis of mechanical systems (single degree and two degrees of freedom). Critical speeds and whirling of shafts, automatic controls, belts and chain drives. Hydrodynamic bearings.

2. Mechanics of Solids : Stress and strain in two dimensions. Principal stresses and strains, Mohr's construction, linear elastic materials, isotropy and an isotropy. Stress-strain relations;, unilaxial loading, thermal stresses in beams : Banding moment and shear force diagrams, bending stresses and deflection of beams, Shear stress 'distribution. Torsion of shafts, helical springs. Combined stresses, Thick and thin walled pressure vessels. Struls 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 guages, inspection of length, position, profile and surface finish.

5. Manufacturing Management: **System design*:*** factory location-simple OR models, plant layout, methods based, applications of engineering economic analysis and break-even analysis for product selection, process selection and capacity planning, predetermind time standards.

System planning, forecasting methods based on regression and decomposition, design and balancing of multi model and stochastic assembly lines, inventory management-probablistic inventory models for order time and order quantitity determination, JIT systems, strategic sourcing, managing inter plant logistics.

System operations and control: Scheduling algorithms for job shops, applications of statistical methods for product and process quality control applications of control charts for mean, range, percent defective, number of defectives and defects per unit, quality cost systems, management of resources, organizations and risks in projects.

System improvement: Implementation of systems, such as total quality management, developing and managing flexible, lean and agile Orgainzations.

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, preignition detonation in S.I. engine. Diesel knock in C.I. engine. Choice of engine fuels. Octance and cetane ratings. Alternate fuels Carburration and Fuel injection, engine emissions and control. Solid, liquid and gaseous fuels, stoichometric air requirements and excess air factor, fuel gas analysis, higher and lower calorific values and their measurements.

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

4. Steam Engineering : Steam generation: modified Ranking cycle analysis, Modern steam boilers, steam at critical and supercritical pressures, draught equipment, natural and artificial draught, boiler fuels solid, liquid and gaseous fuels. Steam turbines-Principle, types, compounding, impulse and reaction turbines, axial thrust.

Steam nozzles: Flow of steam in convergent and divergent nozzle pressure at throat for maximum discharge with different initial steam conditions such as wet, saturated and superheated, effect of variation of back pressure, supersaturated flow of steam in nozzles, Wilson line.

Rankine cycle with internal and external irreversibility, reheat factor, reheating and regeneration, methods of governing, back pressure and pass out turbines.

Steam power plants: Combined cycle power generation, heat recovery steam generators (HRSG) fired and unfired, co-generation plants.

MEDICAL SCIENCE - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

Section-A

1. Human Anatomy : Gross and microscopic anatomy and movements of shoulder, hip and knee joints; Blood supply, nerve innervalion of hand, Lymphatic system; Karyotyping, medical genetics; Electron microscopic structure of glomerulous and muscle; Gross and microscopic anatomy and blood supply of lungs, heart, kidneys, liver, testis and uterus; Gross anatomy of pelvis, perineum and inguinal region. Cross-sectional anatomy of the body and mid-thoracic, upper abdominal, mid-abdominal and pelvic regions.

Embryology : Major steps in the development of lung, heart, kidney, urinary bladder, uterus, ovary, testis and their common congenital abnormalities; Placenta and placental barrier.

Anatomy of Central and Peripheral Autonomic Nervous System : Neural pathways for cutaneous sensations and vision; Cranial nerves, distribution and clinical significance; Anatomy of autonomic control of gastrointestinal, respirator and reproductive systems.

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

Endocrine system : Mechanism of action of hormones, formation, secretion, transport, metabolism, function and regulation of secretion of pancreas and pituitary gland.

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

Blood : Development, regulations and fate of blood cells.

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

3. Biochemistry :*Organ function tests* – liver, kidney, thyroid Protein synthesis, Vitamins and minerals, Restriction fragment length, polymorphism (RFLP), Polymerase chain reaction (PCR), Radio-immunoassays (RIA).

Section-B

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

2. Microbiology : Humoral and cell mediated immunity, Diseases cause by and laboratory diagnosis of – Menningococcus, Saimonella, Shigella, Herpes, Dengue, Polio, HIV/AIDS, Malaria, E. Histolytica, Giardia, Candida, Cryptococcus, Aspergillus.

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

4. **Forensic Medicine and Toxicology** : Forensic examination of injuris and wounds; Physical and chemical examination of blood and seminal stains; Organo phosphorous poisoning, sedative overdose, hanging, drowning, burns, snake envenomation, DNA and finger print study.

Paper-II

Section-A

1. General Medicine : Etiology, clinical features, diagnosis and principles of management (including prevention) of :-

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

Rheumatic, ischaemic and congenital heart disease, hypertension. Cardiomyopathy, pulmonary embolism.

Acute and chronic respiratory infections, bronchial asthma.

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

Actue glomerulonephritis, chronic pyelonephritis, renal failure, nephrotic syndrome, renovascular hypertension, diabetics mellitus, anaemias, coagulation disorders, leukaemia, polycythemia and hyperviscosity syndrome, meningitis encephalitis, carcbrovascular diseases.

Role of Immageology in the workup of medical problems, ultrasound, echo-cardiogram, CT scan, MRI.

Psychiatry : Common psychiatric disorders, schizophrenia. ECT.

2. Paediatrics : Common paediatric problems, congenital cyanotic heart disease, respiratory distress syndrome, broncho pneumonias, kernieterus. IMNCI classification and management, PEM grading and management, AIR and Diarrhea ofo under five and their managemnt

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

Section-B

1. General Surgery : Clinical features, causes, diagnosis and principles of management of-Cervical lymph node enlargement, parotid tumour, oral cancer, cleft palate, harelip, Laryngeal tumour, esophageal tumours, Peripheral arterial diseases, varicose veins, coarctation of arota, dysfunctions of thyroid parathyroids and adrenals, Tumours of Thyroid, Parathyroid, Adrenal, Pituitary Glands, abscess of breast, cancer breast, fibroadenoma and adenosis of breast, acute and chronic appendicitis, bleeding peptic ulcer, tuberculosis of bowel, intestinal obstruction, ulcerative colitis, renal mass, acute retention of urine, benign prostatic hypertrophy. Haemonthorax, constrictive pericarditis, splenomegaly, chronic cholecystitis, portal hypertension, liver abscess, peritonitis, carcinoma head of pancreas, direct and indirect inguinal hernias and their compilations. fractures of femur and spine, Colles' fracture and bone tumours, organis transplantation, kidney, liver, heart, bone-marrow, Laprascopic surgery.

2. Obstetrics and Gynaecology including Family Planning : Diagnosis of pregnancy, screening of high risk pregnancy, foetoplacental development, labour management, complications of 3rd stage, postpartum haemorrhage, resuscitation of the newborn, diagnosis and management of anaemia and pregnancy induced hypertension, principles of the following contraceptive methods. Intra-uterinc devices, pills, tubectomy and vasectomy, medical termination of pregnancy including legal aspects.Etiology, clinical features, diagnosis and principles of management of - Cancer cervix. Leucorrhoea, pelvic pain, infertility, abnormal uterine bleeding, amenorrhoea, Fibroid and prolapsed of uterus.

3. Preventive and Social medicine: Concept of causation and control of disease in the community, principles and methods of Epidemiology, health hazards due to environmental pollution and industrialisation. Normal nutrition and nutritional deficiency diseases in India. Population trends (World and India), Growth of population and its effect on health and development, objectives, components and critical analysis of each of the following National programmes for the control/eradication of :

Malaria, Filaria, Kala-azar, Leprosy, Tuberculosis, Cancer, Blindness, Iodine Deficiency Disease, AIDS & STD and guinea worm.

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

Maternal and child health family welfare Nutrition Immunization.

Philosophy - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

History and Problems of Philosophy

Section-A

1. **Plato :** Theory of Ideas.

2. **Aristotle :** Form, Matter and Causation.

3. **Descartes :** Cartesian Method and Certain Knowledge, God, Mind-Body Dualism,

4. **Spinoza :** Substance, Attributes and Modes, Pantheism; Bondage and Freedom.

5. **Leibnitz :** Monads; Theory of Perception of God.

6. **Locke :** Theory of Knowledge, Rejection of Innate Ideas; substance and qualities.

7. **Berkeley:** Immaterialism, God, Criticism of representative Theory of Perception.

8. **Hume :** Theory of knowledge, Scepticism Self, Causality.

9. **Kant :** Distinctions between synthetic and analytic judgements and between aprion and aposteriori judgements, Space and Time Categories, Possibility of Synthetic Apriori Judgements, Ideas of Reason and Antinomies; Criticism of Proofs for the Existence of God.

10. **Hegel :** Dialectical Method, Absolute Idealism.

11. Moore, Russel and Early Withgenstein : Defence of Commonsense, Refutation of idealism, Logical Atomism, Logical Constructions, Incomplete Symbols, Picture Theory of Meaning, Saying and showing.

12. **Logical Atomism :** Atomic Facts, Atomic sentences, Logical Constructions and Incomplete Symbols (Russell), Distinction of saying and showing (Wittgenstein)

13. **Logical Positivism :** Verification theory of meaning Rejection of Metaphysics, Linguistic Theory of Necessary Propositions.

14. **Phenomenology :** Husserl.

15. **Existentiaslism :** Kierkegaard, Sartre.

16. **Quine :** Radical kempiricism.

17. **Strawson :** Theory of Persons.

18. **Later Wittgenstein :** Meaning and Use, Language games, Critique of Private Language.

Section-'B'

1. **Carvaka :** Theory of Knowledge, Materialism.

2. **Jainism :** Theory of Reality, Saptabhangimaya, Bondage and Liberation.

3. **Buddhism :** Pratityasamutpada, Ksanikavada, Nairatmyavada, Schools of Buddhism, Sautrantika Theory of Pramana. Ideal of Bodhisatva.

4. **Samkhya :** Prakriti, Purush, Theory of Causation, Liberation.

5. **Nyaya-Vaisesika** : Theory of Pramana, Self, Liberation, God and Proofs of God's Existence, Categories, Theory of Causation, Atomistic theory of Creation.

6. **Mimansa :** Theory of Knowledge.

7. **Vedanta :** Schools of Vedanta Sankara, Ramanuja, Madhva (Brahman, Isvara, Atman, Jiva, Jagat, Maya, Avidya Adhyasa, Moksa).

8. Yoga, Citta, Cittavritti, Klesas, Samadhi, Kaivalia.

9. **Aurobindo :** Evoluation, Involution, Integral Yoga.

Paper- II

Section 'A'

Socio-Political Philosophy

1. **Political Ideals :** Equality, Justice, Liberty.
2. Sovereignty (Austin, Boidin, Laski, Kautilya).
3. Individual and State.
4. **Forms of Government :** Monarchy, Theocracy and Democracy.
5. Socialism and Marxism.
6. Humanism.
7. Secularism.
8. **Crime and Punishment :** Corruption, Mass Violence, Genocide, Capital Punishment
9. Co-existence and violence; Sarvoday.
10. **Gender Discrimination :** Female Foeticide, Land and Property Rights, Empowerment.
11. Development and Social progress.
12. Philosophy of Ecology.
13. **Caste Discrimination:** Gandhi and Ambedkar

Section-'B'

Philosophy of Religion

1. **Notions of God :** Personalistic, Imparsonalistic, Naturalistic.
2. Proofs of the Existence of God and their criticisms.
3. Immortality of Soul.
4. Liberation.
5. Problem of Evil.
6. Religious Knowledge : Reason, Revelation and Faith.
7. Religion without God.
8. Religion and Morality.
9. **Religious Experience:** Nature and Object (Indian and Western).
10. Religious Pluralism and the problem of Absolute Truth.
11. **Nature of Religious Language:** Analogical and Symbolic, Cognitivist and Non-cognitive.

Physics - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

Section-A

1. Classical Mechanics

(a) **Particle dynamics :** Law of motion, conservation of energy and momentum, applications to rotating frames, centripetal and Coriolis accelerations, motion under a central force, conservation of angular momentum, Kepler's laws, Fields and potentials – Gravitational field and potential due to spherical bodies, Gauss and Poison equations, gravitational self energy, two body problem, reduced mass, Rutherford scattering, centre of mass and laboratory reference frames.

(b) **Rigid body dynamics :** System of particles, Centre of mass, angular momentum, equations of motion, conservation theorems for energy, momentum and angular momentum, elastic and inelastic collisions, rigid body, degrees of freedom, Euler's theorem, angular velocity, angular momentum, moments of inertia, theorems of parallel and perpendicular axes, equation of motion for rotation, molecular rotations(as rigid bodies), Di and triatomic molecules, precessional motion, top, gyroscope.

2. Special Relativity, Waves & Geometrical Optics

(a) Special Relativity : Michelson-Money experiment and its implications. Lorentz transformations-length contraction, time dilation, addition of velocities, aberration and Doppler effect, mass-energy relation, simple applicatior to a decay process. Minkowski diagram, four dimensional momentum vector. Covariancc of equations of physics.

(b) **Waves :** Simple harmonic motion, damped oscillation, forced oscillation and resonance. Beats. Stationary wave in a string. Pulses and wave packets. Phase and group velocities. Reflection and Refraction from Huygens' principle.

(c) **Geometrical Optics :** Laws of relfection and refraction from Fermat's principle. Matrix method in paraxial optic-thin lense formula, nodal planes, system of two thin lenses, chromatic and spherical aberrations.

3. Physical Optics

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

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

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

Section-B

4. Electricity and Magnetism

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

(b) **Current Electricity :** Kirchhoffs laws and their applications. Biot-Savart law, Ampere's law, Faraday's law, Lenz' law. Self-and mutual-inductances. Mean and rms values in AC circuits. LR C.R and LCR circuits- scries and parallel resonance. Quality factor, principal of transformer.

5. Electromagnetic Theory *&* Black body Radiation

(a) Electromagnetic Theory : Displacement current and Maxwell's equatons. Wave equations in vacuum, Poynting theorem. Vector and scalar potentials. Gauge invariance, Lorenlz and Coulomb gauges. Electromagnetic field tensor, covariance of Maxwell's equations. Wave equations in isotropic dielectrics, reflection and refraction at the boundary of two dielectrics. Fresnel's relations. Normal and anomalous dispersion. Rayleigh scattering.

(b) **Blackbody radiation :** Blackbody radiation and Planck’s radiation law- Stefan-Boltzmann law, Wien’s displacement law and Rayleigh-Jeans law. Planck mass, Planck length, Planck time,. Planck temperature and Planck energy.

6. **Thermal and Statistical Physics**

(a) Thremodynamics: Laws of thermodynamics, reversible and irreversible processes, entropy, Isothermal, adiabatic, isobaric, isochoric processes and entropy change. Otto and Diesel engines, Gibbs' phase rule and chemical potential, Van der Waals equation of state of a real gas, critical constants. Maxwell-Boltzman distribution of molecular velocities, transport phenomena, equipartition and virial theorems. Dulong-Petit, Einstein, and Debye's theories of specific heat of solids. Maxwell relations and applications. Clausius- Clapeyron equation. Adiabatic demagnetisation, Joule-Kelvin effect and liquefaction of gases.

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

Paper-II

Section-A

1. Quantum Mechanics : Wave-particle dualitiy. Schroedinger equation and expectation values. Uncertainty principle. Solutions of the one-dimensional Schroedinger equation for free particle (Gaussian wave-packet), particle in a box, particle in a finite well, linear harmonic oscillator. Reflection and transmission by a potential step and by a rectangular barrier. Use of WKB formula for the life-time calculation in the alpha-decay problem. Particle in a three dimensional box, density of states, free electron theory of metals. Angular momentum problem. The hydrogen atom. The spin half problem and properties of Pauli Spin matrices.

2. Atomic Physics : Stern-Gerlach experiment, electron spin, time structure of hydrogen atom. L-S coupling, J-J coupling. Spectroscopic notation of atomic states. Zeeman effect. Frank-Condon principle and applications.

3. Molecular Physics : Elementary theory of rotational, vibratonal and electronic spectra of diatomic molecules. Raman effect and molecular structure. Laser Raman spectroscopy Importance of neutral hydrogen atom, molecular hydrogen and molecular hydrogen ion in astronomy Fluorescence and Phosphorescence. Elementary theory and applications of NMR and EPR, Elementary ideas about Lamb shift and its significance.

Section-B

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

5. **Particle Physics *&* Solid State Physics**

(a) Particle Physics : Classification of elementary particles and their interactions. Conservation laws. Quark structure of hadrons. Field quanta of electroweak and strong interactions. Elementary ideas about unification of forces. Physics of neutrinos.

(b) **Solid State Physics :** Cubic crystal structure. Band theory of solids conductors, insulators and semiconductors. Elements of superconductivity, Meissner effect, Josephson junctions and applications. Elementary ideas about high temperature superconductivity.

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

Political Science and International Relations - Optional

of Part D - Main Examination of Civil Services Exam

Paper-1

Political Theory and Indian Politics

Section-A

1. **Approaches to the study of political theory:** Historical, normative and empirical.

2. **Theories of state:** Social contract, Liberal, -Neo-liberal, Marxist, communitarian, post- colonial.

3. **State Sovereignty:** Marxist and pluralistic theories; globalisation and the State.

4. **Democracy and Human Rights:** Democratic theory-classical and contemporary. Theories of Human Rights; Theories of justice, equality and revolution, political obligation; New-Social Movements.

5. **Theories of Political Culture:** Culture and politics in Third World countries.

6. **Theories of Political Economy:** Classical and contemporary.

7. **Political Ideologies:** Nature of Ideology; Liberalism, Socialism, Marxism, Fascism,. Gandhism and Anarchism.

8. **Concept of power:** Hegemony, ideology and legitimacy.

9. **Indian Political Thought:** Diharamshastra, Arthashastra and Budhist Traditions, Sir Syed Ahmed Khan, Sri Aurobindo, M.K.Gandhi, B.R.Ambedkar, M.N.Roy.

10. **Political Thought:** Plato, Aristotle, Machiavelli, Hobbes, J S Mill, Hegel and Marx, Lenin, Rosa Luxernberg and Mao Zedong.

Section-B

Indian Government and Politics

1. **Indian Nationalism:** Dadabhai Naoroji, Tilak, Savarkar, Gandhi, Jayaprakash Narain, Nehru, Subhas Bose, Ambedkar, Ram Manobar Lohia.

2. **Nature and struggle of Indian freedom struggle :** From constitutionalism to mass Satyagraha, Revolutionary Movements, Non-co-operation, Civil Disobedience and Quit India, Indian Naval uprising, Indian National Army; role of women in freedom struggle.

3. **Socio-economic dimensions of the nationalist movement:** The communal question and the demand for partition; backward caste movements, Trade union and Peasant movements, Civil rights movement.

4. **Landmarks in Constitutional Development during British Rule:** Morley-Minto Reforms; Montagu- Chelmsford Reforms; Simon Commission; Government of India Act, 1935; Ciipps Mission : Indian Independence Act, 1947.

5. **Salient Features of the Indian Constitution:** The Preamble, Fundamental Rights and Duties, Directive Principles; Federalism, Parliamentary System; Amending Procedures; Judicial Review.

6. **The Executive System in theory and practice:** President, Prime Minister and the Council of Ministers; Governor, Chief Minister and the State Council of Ministers, the Bureaucracy.

7. **Role and function of the Parliament and Parliamentary Committee :** Lok Sabha and Rajya Sabha; changing socio economic profile.

8. **The Supreme Court and the High Courts**: Judicial Activism; P1L.

9. **Statutory Institutions/Commissions** : UPSC, Election Commission, Comptroller and Auditor General, Backward Classes Commission, National Commission for women; National Human Rights Commission; Minorities Commission.

10. **Party system :** Ideology and social base of parties; fragmentation and regionalisation. Pressure groups; patterns of coalition politics; trends in electoral behaviour.

11. Caste, Religion and Ethnicity In Indian Politics.

12. **Planning and Economic Development** : Role of the Planning Commission; Planning in the era of liberalisation; political dimensions of economic reforms.

13. **Grassroots Democracy :** Panchayati Raj and Municipal Government; Significance of 73rd and 74th Amendments. Grass root movement and women's empowerment.

Paper - II

Comparative Politics and International Relations

Section-A

Comparative Analysis and International Politics

1. **Approaches to the study of comparative politics** : traditional approaches; political economy, political sociology or political system approaches; Nature of political process in the Third World.

2. **The Modern State :** Evolution, the contemporary trends in the advanced industrial countries and the third world.

3. Development: Strategies and contemporary discourse.

4. **Concepts of International politics :** Power, national interest, balance of power, national security,collective security and peace.

5. **Approaches to the Study of International Relations**: Idealist, Realist, Marxist, Functionalist and Systems theory.

6. **Determinants of foreign policy :** Domestic compulsions, geopolitics, geoeconomics and global order.

7. Origin and contemporary relevance of the Cold War, nature of the post-cold war global order.

8. **Major issues of world politics :** Cuban Missile Crisis; Vietnam War, Oil Crisis, Afghan Civil War, Gulf War, Collapse of the Soviet Union, Yugoslav Crisis.

9. **Non-alignment :** Concept and movement; Third World Movements for global justice, Non-alignment in the post cold war era.

10. The evolution of the international economic systcm-from Bretton woods to WTO, the North-South dimension.

11. **International Organisations UN and its specialized agencies** : International Court of Justice; ILO, UNICEF, WHO UNESCO.

12. Regional, Organizations such as the ASEAN, APEC, EU. SAARC, NAFTA

13. **Contemporary Global Concerns :** Democracy, Human Rights, Ecology, Gender Justice, Global commons, Communication.

Section-B

India and the World

1. **Indian Foreign Policy :** Historical origins, determinants of foreign policy ; the institutions of policy-making; continuity and change.
2. **India and the Non-Alignment Movement:** Evolution and contemporary relevance. Sociopolitical basis of non-alignment-domestic and global.
3. **Major issues in Indian foreign policy :** Sino-Indian Border War (1962); Indo-Pakistan War (1971) and the liberation of Bangladesh; 1PKF in Sri Lanka India as military nuclear power (1998).
4. **Conflict and co-operation in South Asia** : India's relations with Pakistan, Sri Lanka, Bangladesh, Nepal, Regional co-operation and SAARC. Kashmir question in India's foreign policy.
5. India's relation with Africa and Latin America.
6. India and South East Asia; ASEAN.
7. **India and the major powers :** USA, EU, China, Japan and Russia.
8. **India and the UN System** : India's role in UN Peace- Keeping and global disarmament.
9. India and the emerging international economic order; multilateral agencies-WTO, IMF, IBRD, ADB.
10. India and the Nuclear Question: Changing perceptions and policy.

Psychology - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

Foundations of Psychology

Section-A

1. **Introduction :** Psychology as a Science : Definitions and perspective. Psychology in relation to other social and natural sciences. Use of interdisciplinary approach.
2. **Methods of Psychology** : Characteristics and components of methods in psychology (induction, deduction and introspection) observation, Survey, Laboratory and field experiments Clinical and case study. Experimental and quasi experimental methods. Focussed group discussion, brain storming, grounded theory approach.
3. **Research methods and quantitative analysis :** Major steps in psychological research (problem statement, hypothesis formulation, research design, sampling, tools of data collection, analysis and interpretation and report writing). Fundamental versus applied research, Methods of data collection (interview, observation, questionnaire and case study). Research Designs (Ex-post facto and experimental). Application of statistical techniques (t-lest, two-way ANOVA correlation and regression and chi-square tests).
4. **Development of Human Behaviour :** The nature, origin and development. Role of genetic and environmental factors in determining human behaviour. Influence of cultural factors in socialisation. Life span development-the critical periods and their handling, mastery of the developmental tasks, influence of child rearing practices and its impact on the growth and development of the individual, concept of national character. Sensation – concepts of threshold, absolute and difference thresholds, signal-detection and vigilance.
5. **Attention and perception :** Attention - factors, influencing attention including set and characteristics of stimulus. Sensation-concepts of threshold, absolute and difference thresholds, signal detection and vigilance. Definition and concept of perception,

biological factors in perception. Perceptual organisation-influence of past experiences, Perceptual defence-factors influencing, space and depth perception, size estimation and perceptual readiness. The plasticity of perception, extrasensory perception, culture and perception, subliminal perception.

6. Learning : Concepts and theories of learning (Pavlov, Skimer and Piaget). The processes of extinction, discrimination and generalisation. Programmed learning, probability learning, self instructional learning, concepts, types and the schedules of reinforcement, modelling and social learning.

7. **Memory :** Concepts and definition of memory and forgetting, 7+/-2 concept and clumking Encoding, storage and retrieval. Factors influencing- retention and forgetting. Theories of forgetting (Repression, Decay and Interference theories). The concept of reminiscence.

Section-B

8. Thinking and Problem Solving : Concept formation processes. Reasoning and problem solving. Creative thinking and fostering creativity. Information processing. Decision making and judgment.

9. Intelligence and Aptitude : Concept of intelligence and aptitude, nature and theories of intelligence, Spearman, Thurstone, Gulford Vernon, Sternberg and J.P.Das. Emotional intelligence, social intelligence, measurement of intelligence and aptitudes, concept of IQ deviation IQ, constancy of IQ. Measurement of multiple intelligence- fluid intelligence and crystallized intelligence.

10. **Motivation and Emotion :** Definition and concepts. Theories and physiological basis of motivation and emotion. Measurement of motivation and emotion Motivation and emotion-their effects on behaviour.

11.Personality : Concept and definition of personality. Theories of personality (psychoanalytical, socio-cultural, interpersonal, developmental, humanistic, behaviouristic, trait and type approaches). Measurement of personality (projective tests, pencil-paper test). The Indian approach to Personality. Training for personality development.

12. Language and Communication : Human language-properties, structure and linguistic hierarchy, Language acquisition-predisposition, critical period hypothesis. Theories of language development (Skinner; Chomsky), Process and types of communication. Effective communication and training.

13. Attitudes, Values and Interests : Definitions, concepts of attitudes, values and interests. Components ofattitudes, values and interests. Formation and maintenance of attitudes. Measurement of attitudes, values and interests. Theories of attitudes, and attitudes changes and strategies for fostering values.

14. Recent Trends : Computer application in the psychological laboratory and psychological testing. Artificial intelligence. Psychocybernetics. Study of consciousness-sleep-walk schedules; dreams, stimulus deprivation, meditation, hypnotic/drug induced states, Extrasensory perception. Inlersensory perception Simulation studies.

Paper - II

Psychology : Issues and Applications

Section - A

1. **Psychological Measurement of Individual Diference** : The nature of individual differences, Characteristics and construction of standardized psychological tests. Types of psychological tests. Use, misuse and limitation of psychological tests. Ethical issues in the use of psychological tests.

2. **Well being and Mental Disorders** : Concept of health, positive health, well being and ill health casual factors in, Mental disorders (Anxiety disorders, mood disorders, schizophrenia and delusional disorders; personality disorders, substance abuse disorders). Factors influencing positive health, well being, lifestyle and quality of life.

3. **Therapeutic Approaches** : Psychodynamic therapies. Behaviour therapies. Client centered therapy. Cognitive therapies. Indigenous therapies (Yoga, Reiki, Meditation) Biofeedback therapy. Prevention and rehabilitation of the mentally ill.

4. **Work Psychology and Organisational Behaviour :** Personnel selection and training. Use of Psychological tests in the industry, Training and human resource development. Theories of work motivation. Leadership and participatory management. Advertising and marketing. Stress and its management, ergonomics, consumer psychology, managerial effectiveness, transformational leadership, sensitivity training, power and politics in organizations.

5. **Application of Psychology to Educational Field :** Psychological principles underlying effective teaching-learning process.Learning styles Gifted, retarded, learning disabled and their training. Training for improving memory and better academic achievement. Personality development and value education. Educational, vocational guidance and Career counselling. Use of Psychological tests in educational institutions.

6. **Community Psychology :** Definition and concept of Community Psychology. Role of community psychologists in social change. Use of small groups in social action. Arousing community consciousness and action for handling social problems. Group decision making and leadership for social change.

7. **Rehabilitation Psychology :** Primary, secondary and tertiary prevention programmes-role of psychologists. Organising of services for rehabilitation of physically, mentally and socially challenged persons including old persons. Rehabilitation of persons suffering from substance abuse, juvenile delinquency, criminal behaviours. Rehabilitation of victims of violence. Rehabiliation of HIV/AIDS victims.

Section – B

8. **Application of Psychology to disadvantaged groups :** The concepts of disadvantaged, deprivation and socially deprived. Social, physical, cultural and economic consequences of disadvantaged and deprived groups. Educating and motivating the disadvantaged towards development.

9. **Psychological and the problem of social integration :** The concept of social integration. The problem of caste, class, religion and language conflicts and prejudice. Nature and manifestation of prejudice between the ingroup and outgroup. Casual factors of such conflicts and prejudices. Psychological strategies for handling the conflicts and prejudices. Measures to achieve social integration.

10. **Application of psychology in Information Technology and Mass media :** The present scenario of information technology and the mass media boom and the role of psychologists. Selection and training of psychology professionals to work in the field of IT and mass media. Distance learning through IT and mass media. lintrepreneurship through e-commerce. Multilevel marketing. Impact of TV and fostering value through IT and mass media. Psychological consequences of recent developments in Information Technology.

11. **Application of Psychology in the field of Defence :** The concept of Military psychology, Aviation psychology and Psychological warfare role of military psychologists in the defence. Selection, recruitment and training of personnel. Facilitating the process of adjustment of personnel to military life-role of counselling. Devising psychological tests for defence personnel. Psychological disorders due to war. Human engineering in defence.

12. **Psychology and Economic development :** Achievement motivation and economic development. Characteristics of entrepreneurial behavior. Motivating and Training people for entreprcneurship and economic development. Women Entrepreneurs. Consumer rights and consumer courts.

13. **Application of psychology to environment and related fields :** Environmental psychology-effects of noise, pollution and crowding. Population psychology-psychological consequences of population explosion and high population density. Motivating for small family norms. Impact of rapid scientific and technological growth on degradation of environment.

14. **Other applications of psychology :** Sports psychology-improving performance of sports personnel, psychology and understanding of political behaviour. Voting behaviours. Psychology of corruption and strategies to deal with Psychology of terrorism.

Public Administration - Optional

of Part B - Main Examination of Civil Services Exam

Paper- I

Administrative theory

Section – A

1 **Introduction** : Meaning, scope and significance of Public Administration, Public and Private Administration, Wilson's vision of Public Administration, Evolution of the discipline and its present status. New Public Administration, Public Choice approach and New Public Management perspective. Features of Entrepreneurial Government, Good Governance : concept and application, New Public Management.

2. **Theories of Administration** : Nature and typologies; Scientific Management (Taylor and the Scientific Management Movement), Classical Theory (Fayol, Urwick, Gulick and others), Bureaucratic Theory. (Marxist view, Weber's model and its critique, post-Weberian developments.) Ideas of Mary Parker Follett and (C.I. Barnard) Human Relations School (Elton Mayo and and others). Behavioral Approach to Organizational Analysis. Participative Management; (Mc.Gregor, Likert and others). The Systems Approach; Open and closed systems.

3. **Structure of public organisations** : Typologies of Political Executive and their functions. Forms of public organizations : Ministries and Departments : Corporations; Companies, Boards and Commissions; Ad hoc and Advisory bodies. Headquarters and Field relationships.

4. **Administrative Behaviour** : Process and techniques of decision-making, communication, morale, motivation theories content, process and contemporary, theories of leadership, traditional and modern.

5. **Accountability and Control** : Concepts of accountability and Control; Legislative Executive and Judicial Control over administration. Citizen and Administration, Role of Civil society, people's participation, Right to information, administrative corruption, machinery for redressal of citizens' grievances. Citizens Charter.

6. **Administrative Law :** Meaning and Significance. Delegated legislation : Types, Advantages, Limitations, safeguards, administrative Tribunals : limitations and methods of ensuring effectiveness.

Section – B

7. **Administrative Reforms :** Meaning, process and obstacles. Techniques of administrative improvement : O and M; Work Study and Work Management, Information Technology.

8. **Comparative Public Administration** : Historical and sociological factors affecting administrative systems, administration and politics in different countries, current status of comparative public administration, ecology and administration, Riggsian models and their critique.

9. **Development Administration :** Origin and purpose, Rigg's Prismatic-Sala Model; Bureaucracy and Development; Changing profile of Development Administration; new directions in people's self development and empowerment.

10. **Public Policy** : Relevance of Policy making in Public Administration. Model of Policy-making Sectoral policies (e.g. Energy, Industries Education and Transport Policies) Process of Policy formulation, problems of implementation, feed-back and evaluation.

11. **Personnel Administration** : Objectives of Personnel Administration. Importance of human resource development. Recruitment, training, career development, position classification, discipline, performance appraisal, promotion, pay and service conditions; employer- employee relations, grievance redressal mechanism integrity and code of conduct.

12. **Financial administration** : Monetary and fiscal policies. Resource mobilisation : tax and non-tax sources. Public borrowings and public debt. Concepts and types of budget. Preparation and execution of the budget. Deficit financing Performance budgeting. Legislative control, Accounts and Audit. Organisation and methods, work study and work management, e-governance and information technology, management aid tools like network analysis, MIS, PERT, CPM.

Paper- II

Indian Administration

Section – A

1. **Evolution of Indian Administration :** Kautilya, Mughal period, British legacy.

2. **Constitutional framework :** Value premises of the Constitution, Parliamentary democracy, federalism, Planning. Human Rights : National Human Rights Commission.

3. **Union Government and Administration :** President Prime Minister, Council of Ministers, Cabinet committees, Cabinet Secretariat, Prime Minister's Office, Central Secretariat, Ministries and Departments, Advisory Bodies, Boards and Commissions, Field organizations.

4. **State Government and Administration-Governor,** Chief Minsiter, Council of Ministers, Chief Secretary, State Secretariat, Directorates.

5. **District Administration:** Changing role of the District Collector : Law and Order and development management. Relationship with functional departments. District administration and the Panchayati Raj institutions. Role and functions of the Sub-Divisional Officer.

6. **Local Government** : Panchayati Raj and Urban local Government. Structures, Functions, finances. Main features of 73rd and 74th Constitutional Amendcments Problems of implementation. Major rural and urban development' programmes and their management.

7. **Public Sector** : Forms of public undertakings. Their contribution to the economy; problems of autonomy and accountability. Changing role of the public sector in the context of liberalisation.

Section – B

8. **Civil Services:** Constitutional position, structure, recruitment, training and capacity building, good governance initiatives, code of conduct and discipline, staff associations, political rights, grievance redressal mechanism, civil service neutrality, civil service activism.

9. Control of Public Expenditure: Parliamentary control Estimates Committee, Public Accounts Committee, Committee on Public Undertakings, Office of the Comptroller and Auditor General of India, Role of the finance ministry in monetary and fiscal policy area, co-ordination and economy in expenditure.

10. Administrative Reforms : Reforms since independence. Reports of the Administrative Reforms Commission, Problems of implementation.

11. **Machinery for Planning** : Role, composition and review of functions of the Planning Commission; Role of the National Development Council. Process of plan formulation at Union and State levels. Decentralized planning.

12 Administration of Law **and** Order : Role of Central and State Agencies in maintenance of law and order. Criminalisation of politics and administration.

13. **Welfare Administration** : Machinery for welfare administration at the national and state levels. Central Social Welfare Board and the State Social Welfare Boards. Special organizations for the welfare of the Scheduled Castes and Scheduled Tribes. Welfare Programmes for women and children. Problems of child labour. Role of civil society.

14. Major issues in Indian Administration : Problems of Centre-State Relations; Relationship between political and permanent Executives. Values in public service and administrative culture. Lok Pal and Lok Ayuktas. Development and environmental issues. Impact of information Technology on public administration. Indian Administration and Globalisation.

15. **Rural Development:** Institutions and agencies since Independence, rural development programmes, foci and strategies, decentralization and Panchayati Raj, 73rd Constitutional Amendment.

Sociology - Optional

of Part B - Main Examination of Civil Services Exam

Paper-I

General Sociology/Foundations of Sociology/Fundamentals of Sociology

1. Sociology-The Discipline : ***(***a) Modernity and social changes in Europe and emergence of Sociology. (b) Scope of the subject and comparison with other social sciences. (c) Sociology and common sense.

2. **Scientific Study of Social Phenomena :** (a) Science, scientific method and critique. (b) Major theoretical stands of research methodology. (c) positivism and its critique. (d) Fact value and objectivity. (e) Non –positivist methodologies.

3. Techniques of data collection and analysis : (a) Qualitative and quantitative methods. (b)Techniques of data collection. (c) Variables, sampling, hypothesis, reliability and validity.

4. **Pioneering contributions to Sociology:**

a) Karl Mark : Historical materialism, mode of production, alienation and class struggle.
b) Emile Durkhteim : Division of labour, social fact, religion and society.
c) Max Weber : Social action, ideal types, authority, bureaucracy, protestant ethic and the spirit of capitalism.
d) Talcott. Parsons : Social system, pattern variables.
e) Robert K. Merton : Latent and manifest functions, anomic, conformity and deviance, reference groups.

5. **Marriage and Family :**Types and forms of marriage; family-structure and function; personality and socialization; Social control; family, lineage, descent and property; changing structure of family marriage and sex roles in modem society; divorce and its implications; gender issues; role conflicts.

6. **Social Stratification** : Concepts-hierarchy, inequality and stratification; theories of stratification-Marx, Davis and Moore and Melvin Tumin's critique; forms and functions; class-different conceptions of class; class-in-itself and class-for-itself; caste and class; caste as a class.

7. **Social Mobility** : Types of mobility-open and closed models; intra-and inter-generational mobility; vertical and horizontal mobility; social mobility and social change.

8. **Economic System** : Sociological dimensions of economic life; the impact of economic processes on the larger society; social aspects of division of labour and types of exchange; features of pre-industrial and industrial economic system; industrialisation and social change; social determinants of economic development.

9. **Political System** : The nature of power-personal power, community power, power of the elite, class power, organisational power, power of the un-organised masses; authority and legitimacy; pressure groups and political parties; voting behaviour; modes of political participation-democratic and authoritarian forms.

10. **Educational System** : Education and Culture; equality of educational opportunity; social aspects of mass education; problems of universalisation of primary education; role of community and state intervention in education; education as an instrument of social control and social change; education and modernisation.

11. **Religion** : Origins of religious beliefs in pre-modern socicites; the sacred and the profane; social functions and dysfunctions of religion; monistic and pluralistic religion; organised and unorganised religions; scmitism and antisemitism; religion,, sect and cults; magic, religion and science.

12. **Science & Technology** :Ethos of science; social responsibility of science; social control of science; social consequences of science and technology; technology and social change.

13. **Social Movements** :Concepts of social movements; genesis of social movements; ideology and social movement; social movement and social change; types of social movements.

14. **Social change *in Modern Society:*** (a) Sociological theories of social change. (b) Development and dependency, (c) Agents of social change. (d) Education and social change. (e) Science, technology and social change.

Paper- II

Study of Indian Society

1. **Historical Moorings of the Indian Society :** (i) Perspective on the Study of Indian Society: (a) Indology (G.S. Ghure). (b) Structural functionalism (M.N.Srinivas). (c) Marxist sociology (A.R.Desai). (ii) Impact of colonial rule on Indian society: (a) Social background of Indian nationalism. (b) Modernization of Indian tradition. (c) Protests and movements during the colonial period. (d) Social reforms.

2. **Caste System** : Origin of the caste system; cultural and structural views about caste; mobility-in caste; caste among Muslims and Christians; change and persistence of caste in modern India; issues of equality and social justice; views of Gandhi and Ambedkar on caste; caste on an Indian polity; Backward Classes Movement; Mandal Commission Report and issues of social backwardness and social justice; emergence of Dalit consciousness.

3. **Class Structure** : Class structure in India, agrarian and industrial class structure; emergence of middle class; emergence of classes among tribes; elite formation in India.

4. **Marriage, Family and Kinship:** Marriage among different ethnic groups, its changing trends and its future; family-its structural and functional aspects-its changing forms; regional variations in kinship systems and its socio-cultural correlates; impact of legislation and socio-economic change on marriage and family; generation gap.

5. **Agrarian Social Structure :** Peasant society and agrarian systems; land tenure systems-historical perspectives, social consequences of land reforms and green revolution; feudalism-semi-feudalism debates; emerging agrarian class structure; agrarian unrest.

6 Industry and Society : Path of industrialisation, occupational diversification, trade unions and human relations; market economy and its social consequences; economic reforms liberalisation, privatisation and globalisation.

7. **Political Processes :** Working of the democratic political system in a traditional society; political parties and their social base; social structural origins of political elites and their orientations; regionalism, pluralism and national unity; decentralisation of power; panchayati raj and nagarpalikas and 73rd and 74th constitutional amendments.

8. Education : Directive Principles of Stale Policy and primary education; education; educational inequality and change; education and social mobility; the role of community and state intervention in education; Universalisation of primary education; Total literacy Campaigns; educational problems of disadvantages groups.

9. Religion and Society : Size, growth and regional distribution of different religious groups; educational levels of different groups; problems of religious minorities; communal tensions; secularism; conversions; religious fundamentalism.

10. Tribal Societies : Distinctive features of tribal communities and their geographical spread, problems of tribal communities-land alienation, poverty, indebtedness, health and nutrition, education; tribal development efforts after independence; tribal policy-isolation, assimilation and integration; issues of tribal identity.

11. Population Dynamics : Population size, growth, composition and distribution; components of population growth; birth rate, death rate and migration; determinants and consequences of population growth: issues of age at marriage, sex ratio, infant mortality rate: population policy and family welfare programmes.

12. **Dimensions of Development :** Strategy and ideology of planning; poverty, indebtedness and bonded labour; strategies of rural development-poverty alleviation programmes; environment, housing, slums, and unemployment; programmes for urban development.

13. **Social Change :** (i) Visions of Social Change in India (a) Idea of development planning and mixed economy. (b) Constitution, law and social change. (c) Education and social change. (ii) Rural and Agrarian Transformation in India (a) Programmes of rural development, Community Development Programme, Cooperatives, poverty alleviation schemes. (b) Green revolution and social change. (c) Changing modes of production in Indian agriculture. (d) Problems of rural labour, bondage, migration. (iii) Industrialization and Urbanisation in India (a) Evolution of modern industry in India. (b) Growth of urban settlements in India. (c) Working class, structure, growth, class mobilization. (d) Informal sector, child labour. (e) Slums and deprivation in urban areas.(iv) Politics and Society (a) Nation democracy and citizenship. (b) Political parties, pressure groups, social and political elite. (c) Regionalism and decentralization of power. (d) Secularization. (V) Challenges of Social Transformation (a) Crisis of development, displacement, environmental problems and sustainability. (b) Poverty, deprivation and inequalities. (c) Violence against women. (d) Caste conflicts. (e) Ethnic conflicts, communalism, religious revivalism. (f) Illiteracy and disparities in education.

14. Social Movements : Reform Movements : Arya Samaj, Satya Sadhak Samaj, Sri Narayanguru Dharma Paripalana Sabha, and Ram Krishna Mission.

Peasant movements-Kisans Sabha, Telengana. Naxalbari.

Backward Castes Movement : Self-respect Movement, backward castes mobilisation in North India.

15. **Women and society :** Demographic profile of women; special problems-dowry, atrocities, discrimination; existing programmes for women and their impact. Situational analysis of children; child welfare programmes.

16. **Social Problems :** Pres institution, AIDS, alcoholism, drug addiction, corruption.

Statistics - Optional

of Part D - Main Examination of Civil Services Exam

Paper- I

1. 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 path mean and almost everywhere, their criteria and inter-relations, Borcel-Cantelli lemma, Chebyshev's in equality and Khintchine's weak laws of large numbers, strong law of large numbers and kolmogorov's theorems, Glivenko-Cantelli theorem, probability generating function, characteristic function, inversion theorem, Laplace transform, related uniqueness and continuity theorems, determination of distribution by its moments. Linderberg and Levy forms of central limit theorem, standard discrete and continuous probability distributions, their inter-relations and limiting cases, simple properties of finite Markov chains.

2. 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 LehmannScheffe 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 esiimators.

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 ralistest and its large sample properties, chi-square goodness of fit test and its asymptotic distribution.Confidence bounds and its relation with tests, uniformly most accurate (UMA) and UMA unbiased confidence bounds.

Kolmogorov's test for goodness of fit and its consistency, sign test and its optimality. Wilcoxon signedanks 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.

3. 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 signficance 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's D-2 and Hotelling's T statistics and their applications and properties, discriminant analysis, canonical correlatons, one-way MANOVA, principal component analysis, elements of factor analysis.

4. 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 : 2n, 32 and 33, confounding in factorial experiments, split-plot and simple lattice designs, transformation of data Duncan's multiple range test.

Paper- II

I. Industrial Statistics: Process and product control, general theory of control charts, different types of control charts for variables and attributes, X, R, s, p, 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-Romin 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, lognonnal, 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.

2. Optimization Techniques: Different, types of models in Operations 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, statistics sensitivity analysis, transportation and assignment problems; rectangular games, two-person zero-sum games, methods of solution (graphical and algerbraic).

Replacement of failing or deteriorating items, group and individual replacement policies, concept of scientific inventory management and analytical structure of inventory problems, simple models with deterministic and stochastic demand with and without lead time, storage models with particular reference to dam type.

Homogeneous discrete-time Markov chains, transition probability matrix, classification of states and ergodic theorems, homogeneous continous-time Markov chains, Poisson process, elements of queuing theory, M/M1, 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.

3. Quantitative Economics and Official Statistics: Determination of trend, seasonal and cyclical components, Box-Jenkins method, tests for stationary 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, test for index numbers like proportionality test, time-reversal test, factor-reversal test, circular test and dimensional invariance test.

General linear model, ordinary least square and generalised least squires methods of estimation, problem of multicollinearlity, consequences and solutions of multicollinearity, autocorrelation and its consequences, heteroscedasticity of disturbances and its testing, test for independence of disturbances, Zellner's seemingly unrelated regression equation model and its estimation, concept of structure and model for simultaneous equations, problem of identification-rank and order conditions of identifiability, two-stage least squares method of estimation.

Present official statistical system in India relating to population, agriculture, industrial production, trade and prices, methods of collection of official statistics, their reliability and limitation and the principal publications containing, such statistics, various official agencies responsible for data collection and their main functions.

4. 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, ficting a logistic curve, population projection, stable population quasi-stable population, techniques in estimation of demographic parameters, morbidity and its measurement, standard classification by cause of death, health surveys and use of hospital statistics.

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

Zoology - Optional

of Part B - Main Examination of Civil Services Exam

Paper - I

Section – A

1. Non-chordata and chordata :

(a) Classfication and relationship of varous phyla upto sub-classes; Acoelomata and Coelomate; Protostomes and Deuterostomes, Bilaterllia and Radiata; Status of Protista, Parazoa, Onychophora and Hemichordata; Symmetry.

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

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

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

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

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

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

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

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

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

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

(l) **Pisces :** Scales, respiration, locomotion, migration,

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

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

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

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

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

Section - B

2. Ecology :

(a) **Biosphere:** Concept of biosphere, biomes, Biogeochemical cyscle, human induced changes in atmosphere including green house effect, ecological sucession, biomes and ecotones, community ecology. Concept of ecosystem – structure and function of ecosystem, types of ecosystem, ecological succession, ecological adaptation.

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

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

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

3. **Ethology:**

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

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

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

(d) Methods of studying animal behaviour.

4. Economic Zoology:

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

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

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

(d) Pests of sugar cane (Pyrilla perpusiella); oil seed (Achaea -janata) and rice (Sitophilus oryzae), transgenic animals.

(e) Medical biotechnology, human genetic disease and genetic councelling, gene therapy.

(f) ***Forensic biotechnology.***

5. Biostatistics :

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

6. Instrumental methods :

(a) Spectrophotomeer, flame photometer, Geiger-Muller counter, scintilliation counting.

(b) Electron microscopy (TEM, SEM).

Paper - II

Section - A

I. Cell Biology :

(a) Structure and function of cell audits organelles(nucleus, plasma membrane, mitochondria, Golgi bodies, endoplasmic reticulum, ribosomes and lysosomes), cell division (mitosis and meiosis), mitotic spindle and mitotic apparatus, chromosome movement.

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

2. Genetics .

a) Gene structure and functions; genetic code.

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

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

(d) Mutations and mutagenesis : radiation and chemical.

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

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

(g) Signal molecules, cell death, defects in signaling pathway and consequences.

(h) Human genome mapping; DNA finger-printing.

(i) RFLP, RAPD and AFLF and application of RFLP in DNA finger- printing, riboazyme technologies, human genome project, genomics and protomics.

3. Evolution : Theory of :

(a) Origin of life

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

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

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

(e) Continental drift and distribution of animals.

4. Systematics

(a) Zoological nomenclature; international code; cladistics.

Section – B

5. Biochemistry

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

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

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

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

(e) Bioenergetics.

6. Physiology (with special reference to mammals)

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

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

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

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

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

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

(g) Vision, hearing and olfaction in man.

(h) Mechanism of hormone action.

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

7. Developmental /Biology

(a) Gametogenesis: spermatogenesis, composition of semen, in vitro and in vivo capacitation of mammalian sperm, Oogenesis, totipotency, fertilization, morphogenesis and morphogen, blastogenesis, establishment of body axes formation, fate map, gestulation in frog and chick, genes in development in chick homeotic genes, development od eye and heart placenta in mammals.

(b) Cell lineage, cell to cell interaction, Genetic and in duced teratogenesis, role of thyroxine in control of metamorphosism amphibian, paedogenesis and neoteny, cell death, aging.

(c) Developmental genes in man, in vivro fertilization, and embryo transfer, cloning.

(d) Stem cells: sources types and their use in human welfare.

(e) Biogenetic law.