MAIN EXAMINATION

COMPULSORY PAPER

01. GENERAL HINDI (सामान्य हिन्दी)

इस पत्र में प्रश्न बिहार विद्यालय परीक्षा समिति के माध्यमिक (सेकेण्डरी) स्तर के होंगे। इस परीक्षा में सरल हिंदी में अपने भावों को स्पष्टतः एवं शुद्ध–शुद्ध रूप में व्यक्त करने की क्षमता और सहज बोध शक्ति की जाँच समझी जायेगी।

अंकों का विवरण निम्न प्रकार होगाः–

निबन्ध	–	30 अंक
व्याकरण	–	30 अंक
वाक्य विन्यास	–	25 अंक
संक्षेपण	–	15 अंक

MAIN EXAMINATION

GENERAL STUDIES

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

02. GENERAL STUDIES PAPER- I

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

03. GENERAL STUDIES PAPER- II

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

In paper-I, Modern History of India and Indian Culture will cover the broad history of the country (with special reference to Bihar) from about the middle of nineteenth century. The modern history of Bihar will include questions on the introduction and expansion of western education (including technical education). It will also have questions on Bihar's role in the freedom struggle of India. Questions will relate to the Santhal Uprising, 1857 in Bihar, Birsa movement, Champaran Satyagrah and the Quit India Movement 1942. A knowledge of the chief features of Mauryan and Pal art and Patna Qulam painting will be expected from the examinees. It would also include questions or Gandhi, Tagore and Nehru. The part relating to statistical analysis, graphs and diagrams will include exercises to test the candidate's ability to draw common sense conclusions from information presented in statistical, graphical or diagrammatical form and to point out deficiencies, limitations or inconsistencies therein.

In Paper II, the part relating to Indian Polity, will include questions on the political system in India including Bihar. In the part pertaining to the Indian Economy and Geography of India, questions will be put on planning in India and the physical, economic and social geography of India and Bihar. In the third part relating to the role and impact of science and technology in the development of India, questions will be asked to test the candidate's awareness of the role and impact of science and technology in India and Bihar Emphasis will be on applied aspects.

04. AGRICULTURE

Section- I

Ecology and its relevance to man, natural resources, their 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.

Agro-climatic Zones of Bihar; Cropping pattern in different agro-climatic zones of the country-with special reference to North Bihar, South Bihar, and Chotanagpur and Santhal Pargana plateau. Impact of high-yielding and short duration varieties on shifts in cropping patterns in Bihar. Concept of multiple cropping, mixed cropping, relay and inter-cropping and their importance in relation to food production. Package of practices for production of important cereals, pulses, oilseeds, fibre, sugar and commercial crops grown during kharif and rabi seasons in different regions of the country. Important spices crops of Bihar-chillies, ginger, turmeric and coriander.

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; integrated weed management; cultural, biological and chemical control of weeds.

Processes and factors of solid formation, classification of Indian soils including modern concepts, Major soil types of Bihar; Mineral and organic constituents of soils and their role in maintaining soil productivity. Problem soils-extent and distribution in India; Problems of soil salinity, alkalinity and acidity and their management. Essential plant nutrients and other beneficial clements in soil and plants, their occurrence, factors aftecting their distribution, functions and cycling in soils. Symbiotic and non-symbiotic nitrogen fixation, Principles of soil fertility and its evaluation for judicious fertilçer use; bio-fertilçers. Problems of Tal Diara and chour lands inBihar, cropping system in such situations.

Soil conservation planning on water-shed basis, Erosion and runoff management in foot hills and valley lands; processes and factors aftecting them Dry land agariculture and its problems. Technolgoy for stabilising agriculture production in rainfed agriculture area.

Water use efficiency in relation to crop production criteria for scheduling irrigations, ways and means of reducing runoff losses of irrigation water. Drainage of Water-logged soils. Role of different command area Development Agencies in agricultural development of Bihar.

Farm management, scope, importance and characteristics. Farm planning and budgeting. Economics of different types of farming systems.

Marketing and pricing of agricultural inputs and outputs; price fluctuations, Types and systems of Farming and factors affecting them. Role of Co-operative marketing and credit in agricultural development of Bihar.

Trend of agricultural production during the last two decades in Bihar Pace of land reforms in Bihar and result out impact on agriculatural productivity.

Argicultural extension, its importance and role, methods of evaluation of extension programmes; Important extension methods and media, rural leader ship, socio-economic survey and status of big, small and marginal farmers and landless agricultural labourers. Farm mechançation and its role in agricultural production and rural employment. Training programmes for extension workers. Krishi Vigyan Kendras, role of non-government organçations (N.G.Os) in extension.

Section- II

Genesis and growth of Agricultural research and education system in Bihar.

Application of principles of plant breeding to the improvement of major field crops, methods of breeding of self and cross-pollinated crops. Introduction selection, hybridçation heterosis and its exploitation. Male sterility and self incompatability, utilçation of Mutation and polyploidy in breeding, use of biotechnology and tissue culture in agriculture.

Heredity and variation, Mendal's law of inheritance, chromosomal theory of inheritance, cytoplasmic inheritance, sex linked, sex influenced and sex limited characters. spontaneous and induced mutations. Quantitative characters.

Important recommended varieties of principal crops in Bihar. Origin and domestication of field crops. Morphology patterns of variation in varieties and related species of important field crops, causes and utilçation of variation in crops improvement.

Seed Technology and its importance; production, processing and testing of seeds of crop plants. Role of National and State seed organçation in production, processing and marketing of improved seed.

Physiology and its significance in agriculture, Nature, physical properties and chemical constitution of protoplasm, Imbibation, surface tension, diffusion and osmosis. Absorption and translocation of water, transpiration and water economy.

Eæymes and plant pigments photosynthesis, modern concepts and factors affecting the process, aerobic and anaerobic respiration.

Growth and development: photo periodism and vernalçation. Auxim, harmones and other plant regulators and their mechanism of action and importance in agriculture.

Climatic requirements and cultivation of major fruits and vegetables in Bihar; their recommended package of practices. Handling and marketing problems of fruits and vegetables; principal methods of preservation, important fruits and vegetable products. Processing techniques and equipments. Role of fruits and vegetables in human nutrition; landscape and floriculture including raising of ornamental plants and design and lay-out of lands and garden.

Diseases and pests of field, vegetable, orchard and plantation crops of Bihar and their causes and management. Classification of plant diseases; principles of plant diseases control including exclusion, eradication, immunçation and protection. Biological control of pests and diseases. Intergarted management of pests and diseases. Pesticides and their formulation. Plant quarantine.

Storage pests of cereals and pulses; hygiene of storage godown, preservation and remedial measures. Hazards of pesticides use and safety measures.

Status and scope of rearing beneficial insects in Bihar; honey bees, silk worm and lac insect. Rice fish culture in Bihar.

Recurrent menace of flood and drought in Bihar and contingency crop planning, food Production and consumption trends in India, in general and Bihar, in particular. National and International food policies, procurement, distribution, processing and production constraints, Relation of food production to national dietary pattern, major deficiencies of calorie and protein.

05. ANIMAL HUSBANDRY AND VETERINARY SCIENCE

Section- 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 Advanced studies in Nutrition Protein- Sources of protein, metabolism and synthesis, protein quantity and quality in relation to requirements. Energy protein ration in a ration.

1.2 Advanced studies in Nutrition Minerals. – Sources, functions, requirements and their relationship of the basic mineral nutrients including trace elements.

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

1.4 Advanced Ruminant Nutrition Dairy Cattle– Nurtients and their metabolism with reference to milk production and its composition. Nutrients requirements for calves, heifers, dry and milking cows and buffaloes. Limitations of various feeding systems.

1.5 Advanced Non-Ruminant Nutrition Poultry- Nutrients and their metabolism with reference to poultry, meat and egg production. Nutrients requirements and feed formulation and broilers at different ages.

1.6 Advanced Non-Ruminant Nutrition Swine – Nutrients and their metabolism with special reference to growth and quality of meat production Nutrients requirements and feed formation for baby-growing and finishing pigs.

1.7 Advanced Applied Animal Nutrition- A critical review and evaluation of feeding experiments, digestibility and balance studies. Feeding standards and measure of feed energy. Nutrition requirements for growth, maintenance and production. Balanced rations.

2. Animal Physiology:

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

2.2 Milk Production and Reproduction and Digestion– Current status of hormonal control of mammary development milk secretion and milk ejection, composition of milk of cows and buffaloes. Male and female reproduction organs, 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 behavior, methods of controlling climatic stress.

2.4 Semen quality, Presevation and Artificial Insemination – Components of semen, composition of spermatozoa, chemical and physical properties of ejeculated semen, factors affecting semen in vivo and in vitro. Factors affecting semen preservation compostition of diluents, sperm concentration transport of diluted semen. Deep Freezing techniques in cows, sheep and goats, swine and poultry.

3. Livestock Production and Management:

3.1 Commercial Dairy Farming- Comparison or dairy farming in India with advanced countries. Dairying under mixed 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.

3.2 Feeding practices of dairy cattle – 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.

3.3 General Problems of sheep, goat, pigs and poultry management.

3.4 Feeding of animals under drought conditions.

4. Milk Technology:

4.1 Organçation of rural milk procurement, collection, and transport of raw milk.

4.2 Quality testing and grading raw milk. Quality storage grades of whole milk, skimmed milk and cream.

4.3 Processing packaging storing distributing marketing defects and their control and nutritive properties of the following milks. Pasteurçed, standardçed, toned, double tones sterilçed, Homogençed, reconstituted, recombined, field and flavoured milks.

4.4 Preparation of cultured milks, cultures and their management Vitamin D soft curd acidified and other special milks.

4.5 Legal standards, Sanitation requirement for clean and safe milk and for the milk plant equipment.

Section- II

1. Genetics and Animal Breeding: Probability applied to Mendelian inheritance Hardy Weiberg Law Concept and measurement of inbreeding and heterozygosity Wright's approach in contrast to Melecot's Estimation of Parameters and Measurements. Fisher's theorem of natural selection, polymorphism polygenic Systems and inheritance of quantitative traits. Casual Components of Variation Biometerical models and covariance between relatives. The theory of pathocoefficient applied to quantitative genetic analysis. Heritability Repeatability and selection models.

1.1 Population, Genetics applied to Animal Breeding. – Population vs. individual, population sçe and factors changing it. Gene numbers, and their estimation in farm animals, gene frequency and zygotic frequency and forces changing them, Mean and variance approach to equilibrium under different situations, sub-division of phenotypic variance; estimation of additive, Non additive genetic and environmental variances in Animal Population, Mendelism and blending inheritance. Genetic nature of differences between species, races, breeds and other sub specific grouping and the grouping and the origin of group differences Resemblances between relatives.

1.2 Breeding systems- Heritability, repeatability, genetics and environmental correlations methods of estimation and the precision of estimates of animal data Review of biometrical relations between relatives. Mating system, inbreeding, out breeding and used phenotypic assertive mating Aids to selections. Family structure of animal population under non-random mating systems. Breeding for threshold traits, selections index, its precision. General and specific combining ability. Choice of effective breeding plans.

Diffferent types and methods of selection, their effectiveness and limitations, selection indices construction of selection in retrospect; evaluation of genetic gains through selection, correlated response in animal experimentations.

Approach to estimation of general and specific combining ability, Diallete fractional diallete crosses, reciprocal recurrent selection; in breeding and hydrçation.

2. Health and Hygiene- Anatomy of Ox and fowl. Histological technique, freezing, paraffin embeding etc. Preparation and staining of blood films.

2.1 Common histological stains, Embryology of a cow.

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

2.3 General Knowledge of pharmacology and the repeutics of drugs.

2.4 Vety-Hygiene with respect of water, air and habitation.
2.5 Most common cattle and poultry diseases, their mode of infection, prevention and treatment etc. Immunity, General Principles and Problems of meat inspection Jurisprudence of Vet practice.
2.6 Milk Hygiene.
3. Milk Product 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 foods; Ice cream and Kulfi, by products; whey products, butter milk, lactose and casein; testing Grading, gudging mill products – ISI and Agmark specification, legal standards, Quality control nutritive properties. Packaging processing and operational control Costs.
4. Meat Hygiene.
4.1 Zoonosis Diseases transmitted from animals to man.
4.2 Duties and role of Veterinarians in a slaughter house to provide meat that is produced under ideal hygienic conditions.
4.3 By products from slaughter houses and their economic utilçation.
4.4 Methods of collection, preservation and processing of hormonal glands for medicinal use.
5. Extension:
5.1 Extension Different methods adopted to educate farmers under rural conditions.
5.2 Urilisation of fallen animals for profit-extension education etc.
5.3 Define Trysem. – Different possibilities and methods to provide self Employment to educated youth under rural conditions.
5.4 Cross breeding as a method of upgrading the local cattle.

06. ANTHROPOLOGY

Section- I

There are three sections. Section- I, Section-II & Section- III. Each Section carries 100 marks. Section I & Section III are compulsory. Candidates may offer either Section II-a or II-b. in Section- II

SECTION- I

I. Meaning and scope of Anthropology and its main branches: (1) Social-Cultural Anthropology, (2) Physical Anthropology, (3) Archaeological Anthropology, (4) Linguistic Anthropology, (5) Applied Anthropology.
II. Community and Social Institutions, Group and association; culture and civilisation; band and tribe.
III. Marriage.- The problems of universal definition; incest and prohibited categories preferential forms of marriage; marriage payments; the family as the corner stone of human society; universality and the family, funcation of the family forms of family-usnclear, extended, joint etc. Stability and change in the family. Forms of marriage. Family and marriage among polyandrous tribes.
IV. Kinship, Desecent, residence, alliance, kins terms and kinship behavior, Lineage and clan Kinship categories.
V. Economic Anthropology; Meaning and scope; mode of exchanger; barter and ceremonial exchange, reciprocity and redistribution; market and trade.
VI. Political Anthropology; Meaning and scope; The locus and power and the functions of legitimate authority in different societies. Difference between State and Stateless political systems. Nation-building processes in new State, law and Justice in simpler societies.
VII. Origins of religion animism and animatism. Difference between religions and magic. Totemism and Taboo.
VIII. Fieldwork and fieldwork traditions in Anthropology.
IX. Study of social organçation, youth organçation, Economic organçation, Political organçation and Religion among Indian Tribes-Oraon, Munda, Ho, Santhal and Birhors of Bihar.

SECTION II (a)

1. Foundation of the theory of organic evolution Lamarckism. Darwinism and the Synthetic theory, Human evolution, biological and cultural dimensions, Microevolution.
2. The Order Primate.- A comprative study of Primates with special reference to the anthoropoid apes and man.

2. (a) Place of Man among animals. – Pisces, Amphibia, Reptiles, Aves, Mamalia, clarification of Mamalia and anthroids.

2. (b) A comparative analysis of anatomical similarities and dissimilarities in man and apes. Intelligence and social life of monkey and apes.

3. Fossil evidence of human evolution.- Lemurids, Tamrioids, Poragpithicus, Prophilopithicus, pliopithicus, Lemnopithicus, Procunsul, Driopithicus, Ramapithecus, Australopithecines, Australopithecus Africanus, Plesianthropus transvalensis, Australopithecus, Prometheus, Paranthropus robustus, Homoertus and Homosapiens.

4. Genetics; Definitaion- The Mendelian principles and its application to human populations. The effects of nutrition, inbreeding and hy-bridçation.

5. (a) Definition of Race;- concept of pure race; race, nation and linguistic groups; race and cultural activities; Racism and dangerous myth.

(b) Racial differentiation of Man and bases of racial classification morphological serilogical and genetic, Role of heredity and environment in the formation of races.

(c) Bass/criterias of racial classification skin colour, Hair, stature, Head form, face form, nose, eye, types of blood groups.

6. Varieties of the Modern Races of Man- the three major races and their sub-races, caucaosoids and its subdivisions. Archaic caucosoid races, Mongoloids and its subdivisions, Negroids and its subdivisions. The American Negros, a comparative study of their Physical genetic and intelligence, similarties and differences.

7. Races in India:-

1. Classification of Riseley with his criticisms

Classification of Haldon

Classification of Eickutodt

Classification of Guha

Classification of Sarkar

The Negrito Racial Elements In India

SECTION II (b)

1. Technique, method and methodology distinguished.

2. Meaning of evolution biological and socio-cultural. The basic assumptions of 19th century evolutionism. The comparative method. Contemporary trends in evolutionary studies.

3. Diffusion and diffusionism—American distributionism and historical ethnology of the german speeking ethnologists. The attack on the "the" comparative method by diffusionists and Fraæ Boas. The nature, purpose and methods of comparision in social cultural, anthoropology. Redcliffe-Brown, Eggan Oscar Lewis and Sarana.

4. Patterns basic personality construct and model personality. The relevance of anthropological approach to national character studies. Recent trends in sychological anthropology.

5. Funcation and cause. Malinowski's contribution to functionalism in social anthropology. Function and structure Redcliffe-Brown. Firth Fortes and Nadel.

6. Structuralism in linguistics and in social anthropology Levistrauss and Leach in viewing social structure as a model. The structuralist method in the study of myth. New ethnography and formal semantic analysis.

7. Norms and Values. Values as a category of anthropological description. Values of anthropologist and anthropology as source of values. Cultural relativism and the issue of universal values.

8. Social anthropology and history, Scientific and humanistic studies distinguished. A critical examination of the plea for the unity of method of the natural and social sciences. The nature and logic of anthropological field work method and its autonomy.

9. (a) Theories and Methods in Anthropologyl

Evolution and comparative Methods;

Herbert Spencer, L H. Morgan, and Edward Burnett Tylor. Limitations.

(b) Particularism:-

Fraæ Boas, A. L. Kroeber, Ruth Benediet Ralph Lintani and Abram Kardiner. Limitations of particularistic approach.

(c) Structive and Function approach.

Emile Durkheim, Pronislar Malinowski, A.R. Redcliffe Brown, Leslic A white, Evans Pritchard and Levi Strous.

10. Contributions of Anthropology to planning and Development: Development studies Socio-cultural dimensions of planned development socio-cultural parameters of Directed change, cultural hurdles to technological changes among tribes in India. Tribal problems-causes, consequences and solutions.

11. Social movement tribal movement, meaning and features. Tribal movement in Bihar Tana Bhagat and Birsa Movement, Changing scenes of tribal movement in Bihar. Tribal leadership in Bihar.

SECTION- III

INDIAN ANTHROPOLOGY

1. Palaeolithic, Mesolithic, Neolithic Protohistoric (Indus civilçation) dimensions of Indian culture.
2. Distribution of racial and linguistic elements in Indian population.
3. The bases of Indian social system: Varna, Ashram, Purushartha, Caste, Joint Family.
4. The growth of Indian anthropology. Distinctiveness of anthropological contribution in the study of tribal and peasant sections of the Indian population. The basic concepts use. Great tradition and little tradition; Sacred complex Universalçation and chialçation. Sanskritçation and Westernçation; Dominant Caste Tribe-Caste continuum. Nature-Man-Spirit complex.
5. Ethnographic profiles of Indian tribes racial linguistic and socio-economic characteristic. Problems of tribal peoples; Land-alienation, indebtedness, lack of educational facilities, shifting cultivation, migration forests and tribls unemployment agricultural labour. Special problems of hunting and food gathering and other miner tribes.
6. The problems of culture contact; impact of urbançation and industrialçation depopulation regionalism economic and sychological frustrations.
7. History of tribal administration. The constitutional safeguards for the Scheduled Tribes Policies, Plans programmes of tribal development and their implementations. The response of the tribal people to the Government measures for them. The different approaches to tribal problems. The role of anthropology in tribal development.
8. The constitutional provisions regarding the Scheduled Castes. Social disabilities suffered by the scheduled castes and the socio-economic problems faced by them.
9. Issues relating to national Intergration.

07. BOTANY

Section- I

1. Microbiology:- Viruses, bacteria plasmids-structure and reproduction. General account of infection and immunology. Microbes in agriculture, industry and medicine, and air, soil and water. Control of pollution using micro-organisms.
2. Pathology- Important plant diseases in India caused by viruses, bacteria, mycoplasma fungi and nematodes. Modes of infection, dissemination, physiology of parasitism and methods of control. Mechanic of action of biocides. Fungal toxins.
3. Cryptogams- Structure and reproduction from evolutionary aspect, and ecology and economic importance of algae, fungi, bryophytes and pteridophytes. Principal distribution in India.
4. Phanerogams:- Anatomy of wood secondary growth Anatomy of C2 and C2 plants, stomatal types, Fmbroyology, barriers to sexual incompatibility. Seed structure. Apomixis and polyembroyony Polynology and its applications. Comparison of systems of classification of angiosperms. Modern trends is biosystematics. Taxonomic and economic importance of cyadacoae, Pinacoee, Gentabes, Magnoliacea. Ramunculaceae, Cruciferac, Rosaceae. Leguminosee Euploiacece, Malvaceae. Dipterocarpaceae, Umbellifcrae, Asclepiadaceae, Verbenaceae, Solanaoceae, Pubiaceae Cucuribitaceae, Compositae, Gramineae, Palmae, Liliaceae, Musaceae and Orchidaceae.
5. Morphogenesis – Polarity, symmetry and totiuotency. Differentiation and dedifferentiation of cells and organs, Factors of morphogenes Methodology and applications of cell, tissue, organ and protoplant cultures from vegetative and reproductive parts Somatic hybrids.

Section- II

1. Cell Biology—Scope and perspective. General Knowledge of modern tools and techniques in the study of cytology. Prokaryotic and eukaryotic selis-structural and ultrastructural details Functions of organelles including membrances. Detailed study of mitosis, meiosis. Numerical and structural variations in chromosome and their significance, study of polytene and lampbrush chromosomes structure, behavior and cytological significance.
2. Genetics and Evolution- Development of genetics and gene concept. Structure and role of nucleic acids in protein synthesis and reproduction. Genetic code and regulation of gene expression, Gene amplification Mutation and evolution. Multiple factors linkage and crossing over. Methods of gene mapping. Sex chromosomes and sex-linked inheritance. Malesterility, its significance in plant breeding. Cytoplasmic inheritance elements of human

genetic. Standard deviation and Chi-square analysis Gene transfer in micro-organisms. Genetic engineering. Organic evolution evidence, mechanism and theories.

3. Physiology and Biochemistry- Detailed study of water relations. Mineral nutrition and ion/transport. Mineral deficiencies Photosynthesis mechanism and importance, photosystems I and II, photorespiration, Respiration and fermentation. Nitrogen fixation and nitrogen metabolism. Protein synthesis. Eæymes, Importance of secondary metabolites. Pigments as photoreceptors, photoporiodism, flowering.

Growth indices, growth movements. Sahescence.

Growth substance- Their chemical nature, role and applications in agrihorticulture.

Agrochemicals, Stress physiology, Vernalçation Fruit and seed physiology- dormancy, storage and germination of seed, Perthenocarphy fruit ripening.

4. Ecology- Ecological factors. Concept and dynamics of community, succession. Concept of biospheres. Conservation of ecosystems. Pollution and its control. Forest types of India. Aforestation, deforestation and social forestry. Endangered plants.

5. Economic Botnay- Origin of cultivated plants. Stydy of plants as sources of food, fodder and forage, fatty oils, wood and timber, fiber, paper rubber, bevarages, alcohol, drugs, narcotics, resins and gums essential oils, dyes, mucilage, insecticides and pesticides. Plant indicators, Ornamental plants, Energy plantation.

08. CHEMISTRY

Section- I

1. Atomic structure and Chemical bonding: Quantum theory, Haisenberg's uncertainty principle, Schrodinger wave equation (time independent). Interpretation of the wave function, particle in a one-dimensional box, quantum members, hydrogen atom wave functions. Shapes of s p and d orbitals Ionic bond; Lattice energy, Born-Haber Cycle, Fajan's Rule dipole moment, characteristics of ionic compounds, electronegativity differences covalent bond and its general characteristics valence bond approach. Concept of resonance and resonance energy. Electronics configuration of H2+H2. N2, O2, F2, NO, CO and HF molecules in terms of molecular orbital approach. Sigma and pibonds. Bond order, bond strength and bond length.

2. Thermodynamics – Work heat and energy. First law of thermodynamics. Enthalpy, heat capacity Relationship between Cp and Cv. Laws of thermochemistry, Kirchoff's equation. Spontaneous and non-spontaneous changes, second law of thermodynamics. Entropy changes in gases for reversible and irreversible processes. Third law of thermodynamics. Free energy, variations of free energy of a gas with temperature, pressure and volume. Gibbs-Helmbolty equation. Chemical potential. Thermodynamic criteria for equilibrium. Free energy change in chemical reactions and equilibrium constant. Effect of temperature and pressure on chemical equilibrium. Calculation of equilibrium constants from thermodynamic measurements.

3. Solid State—Forms of solids, law of constancy of interfacial angles. Crystal systems and crystal classes (crystallorgaphi groups) Designation of crystal faces, lattice structure and unit cell. Laws of rational indices. Bragg's law, X-ray diffraction by crystals. Defects in crystals. Elementary study of liquid crystals.

4. Chemical kinetics- Order and molecularity of reaction. Rate equations (differential and intergrated forms) of zero, first and second order reaction. Half life of a raction. Effect of temperature, pressure and catalysts on reaction rates. Collission theory of reaction rates of bimolecular reactions. Absolute reaction rate theory. Kinetics of polymerçation and photo chemical reactions.

5. Electrochemistry – Limitations of Arrhenius theory of dissociation, Debye Muckel theory of strong electrolytes and its quantitative treatment. Electrolytic conductance theory and theory of activity coefficients. Derivation of limiting laws for various equalibria and transport properties of electrolyte solutions.

6. Concentration cells, liquid junction potential, application of e.m.f. measurements of fuel cells.

7. Photochemistry- Absorption of light. Lambert-Beer's law, Laws of photo chemistry. Quantum efficiency. Reasons for high and low quantum yields. Photoelectric cells.

8. General Chemistry of 'd' block elements:

(a) Electronic configuration: Introduction to theories of bonding in transition metal complexes, crystal field Theory and its modification; applications of the theories in the explanation of magnetism and electronic spectra of meta complexs.

(b) Metal Carbonyls: Cyclopentadienyl, Olefin and acetylene complexes.

(c) Compoundes with metal- metals bonds and metal atom clusters.

9. General Chemistry of 'f' block elements: Lanthanides and actinides; separation, Oxidation, states, magnetic and spectral properties.

10. Reactions in non-aqueous solevent (liquid ammonia and sulphur dioxide).

Section- II

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

Formation and stability of reactive intermediates (carbocations, carbanious free radicals. carbenes, nitrenes and beæynes).

SN1 and SN2 mechanisms. – H, E2 and E1 CB eliminations-cis and trans addition to carbon to carbon double bonds mechanisms of addition to carbon-oxygen double bonds-Micheal addition addition to conjugated carbon-carbon double bonds aromatic electrophillic and nuclephilic substitutions allylic and beæylic substitutions.

2. Pericyclic reactions: classification and examples an elementary study of Woodward Hoff-mann rules of pericylic reactions.

3. Chemistry of the following name reactions: aldol condensation, Claysen condensation, Dieck mann reaction, Perkin reaction, Reimer-Tiemann reaction, Cannçzaro reaction.

4. Polymeric Systems:

(a) Physical chemistry of polymers; End group analysis, Sedimentation, Light Scattering and Viscosity of polymers.

(b) Polythylene Polystyrene, Polyvinyl Chloride, Ziegler Natta Catalysis, Nylon, Terylene.

(c) Inorgenic Polymeric Systems; Phosphonitric halide compounds; silicones; Borazines.

Friedel- Craft reaction Reformatsky reaction, pinacol-pinacilone wagner Meerwein and Backman rearrangements and their mechanisms uses of the following reagents in organic synthesis O5 O4, HIO4, NBS dibocrane, Na-liquid ammonia NaBH4, LiAN4.

5. Photochemical reactions of organic and inorganic compounds types of reactions and examples and synthetic uses- Mehods used in structure determination: Prinicples and applications of uv- Visible IR, IH, NMH and mass spectra for structure determination of simple organic and inorganic molecules.

6. Molecular structural deter mination; Prinicples and application to simple organic and inorganic Molecules.

(i) Rotational spectra of diatomicmolecules (Infrared and Raman) isotopic substitution and rotational constants.

(ii) Vibrational spectra of diatomic, linear symmetric, linear asymmetric and bent tri-atomic molecules (Infrared and Raman).

(iii) Specificity of the funcational groups (Infrared and Raman)

(iv) Electronic Spectra singlet and triplet states, conjugated double bonds, unsaturated carbonyl compounds.

(v) Nuclear Magenetic Reasonance; chemical shift, spin-spin coupling.

(vi) Electron Spin Reasonance, Study of inorganic complexes and free radicals.

09. CIVIL ENGINEERING

Section- I

Part- A Theory and Design of Structures:

(a) **Theory of structures:** Energy theorems – Castigliano theorems I and II, unit load method and method of consistent deformation applied to beams and pinjointed plane frames, Slope deflection, moment distribution and Kani method of analysis applied to indeterminate beams and rigid frames.

Moving loads, criteria, for maximum sheer force and bending moment in beams traversed by a system of moving loads. Influence Lines for simply supported plane pinjointed girders.

Arches: Three hinged, two hinged and fixed archesfrib shortening and temperature effects Infiuence lines.

Matrix methods of analysis: Force method and displacement method.

(b) **Structural steel:** Factors of safety and load factors.

Design of tension and compression members, beams of built up section, riveted and welded plate girders, gantry girders, stanchions with battons and lacings, Slab and gusseted braces.

Design of highway and railway bridges- Through and deck type plate girder, Warren girder and Pratt Truss.

(c) **Reinforced concrete.** Limit state method design- Recommendations of IS codes- Design of one way and two-way slabs, staircase slabs, simple and continuons beams of rectangular, T and L sections.

Compression members under direct load with or without eccentricity, footings, isolated and combined.

Retaining walls, cantilever and counterfort types- Methods and systems of prestressing, Anchorages. Analysis and design of sections for flexure, loss of prestress.

Part- B Fluid Mechanics:

Fluid properties and their role in fluid motion, fluid statics including forces acting on plane and curved surfaces.

Kinematics and Dynamics of Fluid Flow: Velocity and accelerations, stream lines, equation of continuity, irrotational and rotational flows, velocity potential and stream function, flow-nets and methods of drawing flow net, sources and sinks, flow separation and stagnation.

Euler's equation of motion, energy and momentum equations and their applications to pipe flow, free and forced vortices, plane and curved stationary and moving vanes, sluice gates, weirs, orifice meters and venturimeters.

Dimensional Analysis and similitude: Buckinghham's Pi-theorem, similarities, model laws, undistorted and distorted models, movable bed models, model calibration.

Laminar Flow: Laminar flow between paralled stationary and moving plates, flow through tubes, Reynolds' experiments, lubrication principles.

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

Turbulent Flow Through Pipes: Characteristics of turbulent flow, velocity distribution and variation of friction factor, hydraulic grade line and total energy line, siphons, expansions and contractions in pipes, pipe network, water hammer.

Open Channel Flow: Uniform, non-uniform flows, 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, differential equation of gradually varied flow, classification of surface profiles, control section, step method of integration of varied flow equation.

Part- C Soil Mechanics and foundation Engineering:

Soil Compositoin, influence of clay minerals on engineering behavior, Effective stress principle, change in effective stress due to water flow condition, static water table and steady flow conditions permeability and compressibility of soils.

Strength behavior, strength determination through direct and triaxial tests, total and effective stress strength parameters, total and effective stress path.

Methods of site exploration, planning a subsurface exploration programme, sampling procedures and sampling disturbance, penetration tests and plate load tests and data interpretation.

Foundation types and selection, footings, rafts, piles, floating foundations, effect of footing shape, dimexnsions, depth of embedment, load inclination and ground water on bearing capacity, settlement components, computation for immediate and consolidation settlements, limits on total and differential settlement, correction for rigidity.

Deep foundations, philosophy of deep foundations, piles, estimation of individual and group capacity, static and dynamic approaches, pile load tests, separation into skin friction and point bearing, under-reamed piles, well foundations for bridges and aspects of design.

Earth pressure, states of plastic equilibrium, Culmann's procedure for dertermination of lateral thrust, determination of anchor force and depth of penetration, reinforced earth retaining walls, concept, materials and applications.

Machine foundations, modes of vibration, determination of natural frequency, criteria for design, effect of vibration on soils, vibration isolation.

Part- D Computer Programming:

Types of computers, components of computers, history and development, different languages.

FORTRAN/Basic programming, constants, variables, expressions, arithmetic statements library funcations, control statements, unconditional GO-TO Statements computed GO-TO statements, IF and DO statements, CONTINUE, CALL RETURN, STOP, END statement, I/O statements, FORMATS,field specifications.

Subscripted variables, arrays, DIMENSION statement, function and subrouting sub-programmes, application to simple problems with flow charts in civil engineering.

Section- II

Note:- Candidate shall answer questions from any two parts:- Out of four parts below.

Part – A.

Building Construction:

Physical and mechanical properties of construction materials, factors influencing selection, brick and clay products, limes and cements, polymorfic materials and special uses, damp-proofing materials.

Brickwork for walls, types, caving walls, design of brick masonary walls per I.S. code, factors of safety, serviceability and strength requirements, detiling of walls, floors, roots, ceiling, finishing of buildings, plastrxing, pointing, painting.

Functional planning of building, orientation of buildings, elements of fire-proof construction, repairs to damaged and cracked buildings, use of ferrocement, fibre-reinforced and polymer concrete in construction, techniques and materials for low cost housing.

Building estimates and specifications, construction scheduling PERT and CPM methods.

Part – B.

Transportation Engineering:

Roads, Traffic engineering and traffic surveys, intersections, road signs, signals and markings.

Classification of roads, plannings and geometric design.

Design of flexible and rigid pavements, Indian Road Congress guidelines on pavement layers and design methodologies.

Part – C.

Water Resources and Irrigation Engineering,

Hydrology: Hydrologic cycle, precipitation, evaporation, transpiration, depression storage, infiltration, hydrograph, unit hydrograph, frequency analysis, flood estimation.

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

Water resources planning: Ground and surface water resources, single and multipurpose projects, storage capacity of reservoirs, reservoirs losses, reservoir sedimentation, flood routing through reservoirs, economics of water resources projects.

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

Canals: Distribution system for canal irrigation, canal capacity, canal Losses, alignment of main and distributary canals, most efficient section, lined channels, their design, regime theory, critical shear stress, bed load and suspended load transport cost analysis of lined and unlined canals, drainage behind lining.

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

Canal structures: Design of regulation, cross drainage and communication works, cross regulators, head regulartors, canal falls, aqueducts metering flumes and canal outlets.

Diversion head works: Principles of design of weirs on permeable and impermeable foundations, Khosla' s theory, energy dissipation, stilling basins, sediment exclusion.

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

Spillways: Types, crest gates, energy dissipation.

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

Part – D.

Environmental Engineerig: Water supply: Estimation of water resources, ground and surface water, ground water hydraulics, predicting demand of water, impurities of water and their significance, Physical, chemical and bacteriological analysis, water borne diseases, standards for potable water

Intake of Water: Pumping and gravity schemes.

Water treatment: Priniciples of coagulation, flocculation and sedimentation, slow, rapid, pressure, bifolw and multi-media filters, chlorination, softening removal of taste, odour and salinity.

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

Distribution System: layout, hydraulies of pipelines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems using Hardy Cross methods general principles of optimal design based on cost headloss ratio criterion, leak detection, maintenance of distribution systems, pumping stations and their operations.

Sewerage system: domestic and industrial wastes, storm, sewage separate and combined system, flow through sewers, design of sewers, sewer appurtenances, manholes inlets, junctions, siphon. Sewage characerisation: BOD, COD, solids, dissolved oxygen, nitrogen and TOC. Standards of disposal in normal water course and on land.

Sewage treatment: working, Priniciples, units, chambers, sedimentation tank, trickling filters, oxidation ponds, activated sludge process, septic tank, disposal of sludge, recycling of waste water.

Solid waste: Collection and Disposal.

Environmental Pollution: ecological balance, water pollution control acts. radioactive wastes and disposal environmental impact assessment for thermal power plants, mines.

Sanitation: site and orientation of buildings, ventilation and damp proof courses, houses drainage, conservancy and waterbone system of waste disposal, sanitary appliances, latrines and urinals, rural sanitation.

10. COMMERECE AND ACCOUNTANCY

Section- I

Accounting and Finance

Part-I : Accounting, Auditing and Taxation.

Accounting as a financial information system- Imapact of behavioral sciences – Methods of accounting of changing price levels with particular reference to current Purchasing Power (CPP) accounting Advanced problems of companies accounts – Amalgamatiin absorption and reconstruction of companies- Accounting of holding companies – Valuation of shares and goodwill. Controllership functions- Property control legal and management.

Important provisions of the Income Tax Act, 1961 – Definition Charge of Income Tax- Exemptions Depreciation and investmet allowance – Simple problems of computation of income under the various heads and determination of assessable income – Income Tax authorities.

-- Nature and functions of Cost Accounting – Cost classification – Tenchiques of segregating semivariable costs into fixed and variable components – job costing – FIFO and weighted average methods or calculating equivalent units of production – Reconcilation of cost and financial accounts-Marginal Costing-Cost volume profit relationship: Algebraic formula and graphical representation – Shut down point – Techniques of cost control and cost reduction – Budgetary control flexible Budgets – Standard costing and variance analysis –Responsibility accounting-Bases of charging overheads and their inhererent fallacy – Costing for pricing decisions.

Significance of the attest function – Programming the audit work – Valuation and verfication of assets, fixed, wasting and current assets – Verification of liabilities – Audit of limited companies – appointment status, powers, duties and liabilities of the auditor – Auditor's report – Audit of share capital and transfer of shares – Special points in the audit of banking and insurance companies.

Part – II Business Finance and Financial Institutions.

Concept and scope of Financial Management – Financial goals of corporations – capital Budgeting Rules of the thumb and discounted cash flow approaches – Incorporating uncertainty in investment decision–designing an optimal capital structure – Weighted average cost of capital and the controversy surrounding the Modigliani and Miller model, sources of raising short term, intermediate and longterm finace – Role of public and convertible debentures–Norms and guidelines regarding debtequity rations – Determinants of an optional divident policy– optimissing models of James E. walter and John Lintner– Forms of divident payment – Structure of working capital and the variable, affecting, the level of difference of components – Cash flow approach of forecasting working capital needs – Profiles of working capital in Indian industries – Credit management and credit policy – Consideration of tax in relation to financial planning and cash flow statements.

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

Provision of the Negotiable instruments Act, 1881.

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

Section- II

Organisation Theory and Industrial Relations.

Part I : Organisation Theory:

Nature and concept of Organisation – Organisation goals; Primary and Secondary goals, Single and multiple goals, ends-means chain – Displacement, succession, expansion and multiplication of goals – Formal organisation : Type, Structure – Line and Staff. functional matrix and project – Informal organçation, functions and limitations.

Evolution of organçation theory: (classical, Neo-classical and system approach)- Bureaucracy Nature and basis of power, sources of power, power structure and politics – Organisational behaviour as a dynamic system : technical social and power systems interrelation sand interactions – Perception – Status system : Theoretical and empirical foundations of Maslow Megergore, Horzberg Likert, Vroom, Porter and Lawler, Odam and Human Models of motivation. Morale and productivity – Leadership. Theories and styles – Management of Conflicts in organçation – Transactional Analysis – Significance of culture to organçations. Limits of rationality – Simon-March approach. Organisatinoal change, adaptation growth and development – Organisational control and effectiveness.

Part II : Industrial Relations:

Nature and scope of industrial relations. Industrial labour in India and its commitment – Theories of unionism – Trade union movement in India – Growth and structure – Role of outside leadership in – Worker education and other problems – Collective bargaining approaches conditions limitations and its effectiveness in Indian conditions – Korkers participation in management: philosophy, rationale, present day State of affairs and its future prospects.

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

11. ECONOMICS

Section- I

1. The Framework of an Economy. National Income Accounting.
2. Economic choice, Consumer behaviour. Producer behaviour and market forms.
3. Investment decisions and determination of income and employment, Micro-economic models of income, distribution and growth.
4. Banking objectives and instruments of Central Banking and credit policies in a planned developing economy. Performance of Commercial Banks in Bihar.
5. Type of taxes and their impacts on the economy. The impacts of the sçe and the content of budgets. Objectives and Instruments of budgetary and fiscal policy in a planned developing economy.
6. International trade. Tariffs. The rate of exchange. The balance of payments. International monetary and banking institutions.

Section- II

1. The Indian Economy:

Culding priniciples of Indian economic planned growth and distributive Justice' Eradication of poverty.
The institutional framework of the Indian economy – federal Governmental structure – agricultural and industrial sector public and private sectors.
National income its sectroal and regional distribution. Extent and incidence of poverty.

2. Agricultural Production:

Agricultural Policy.
Land reforms. Technological change. Relationship with the industrial sector.

3. Industrial Production:

Industrial Policy.
Public and private sector.
Regional distribution. Control of monopolies and monopolistic practices.

4. Pricing Policies of agricultural and industrial outputs:

Procurement and Public Distribution.

5. Budgetary trends and fiscal policy:
6. Monetary and credit trends and policy, Banking and other financial institutions.
7. Foreign trade and the balance of payments.
8. Indian Planning:

Objectives, strategy, experience and problems.

9. Bihar Economy:

Relative position of agriculture and industry, retarders of economic growth, poverty and unemployment, Progress in Land Reforms.

12. ELECTRICAL ENGINEERING

Section- I

Network:

Steady state analysis of D.C and A.C., networks, network theorems, Matrix Algebra, network functions, transient response, frequency response, Laplace transform, fourier series and fourier transform, frequency spectral plezero concept, elementary network synthesis.

Static and Magnetics:

Analysis of electrostatic and magentostatic fields, Laplace and Poisson Equations, solution of boundary value problems, Maxwell's equations, electromagnetic wave propagation, ground and space waves, prospagation between earth station and satellites.

Measuremetns:

Basic methods of measurements, standards, error analysis, indicating instruments cathode ray oscillo-scope, measurement of voltage current, power, resistance, inductance, Capacitance, time, frequency and flux, electronic meters.

Electronics:

Vaccum and semiconductor devices, equivalent circuits transistor parameters, determination of current and voltage gain and input and output impedances biasing techniques, single and multistage, audio and radio small signal and large signal amplifiers and their analysis reedback amplifiers and oscillators: wave haping circuits and time base generators, analysis of different types of multivilerator and their uses, digital circuits.

Electrical Machines:

Generator of e.m f., m.m.f. and torque in rotating machinens, motor and generator characteristics of d.c synchronous and induction machines equivalent circuits, computation parallel operation, phasor diagram and equivalent, circuits of power transformer, determination of performance and efficiency, auto-transformers, 3-phase transformers.

Section-II

Part-A

Control systems:

Mathematical modeling of dynamic linear control systems, block diagrams and signal flow graphs, transient surprise response steady state error, stability, frequency response techniques, rootlocus techniques series compensation.

Industrial Electronics:

Principles and design of single phase and polyphase rectifiers controlled rectification, smoothing filters, regulated power supplies speed control circuits for drivers, inverters, d.c to d.c conversion, choppera, timers and welding circuits.

Part – B (Heavy Currents)

Electrical Machines:

Induction Machines- Rotating magnetic field, Polyphase motor, principle of operation phaser diagram, Torque slip characteristic, Equivalent circuit and determination of its parameters, circle diagram, starters, speed control double cage motor, Induction generator. Theory, Phaser diagram, characteristies and application of single phase motors. Application of two phase induction motor.

Synchronous Machines – e.m.f equation phase and circle diagram, operation on infinite bus, synchronçing power, operating characterstic and performance by different methods, sudden short circuit and analysis of oscillogram to determine machine reactances and time constants, motor characteristics and performance methods of starting applications.

Speical Machines – Amplidyne and metadyne operating characteristics, and their applications.

Power system and Protection – General layout and economics of different types of power stations, Baseload, peakload and pumped storage plant, Economics of different systems of d.c. and a.c power distribution, Transmission line parameter calculation, concept of G.M.D. short, medium and long transmission line, Insulators, Voltage distribution in a string of insulators and grading, environmental effects on insulators. Fault calculation by symmetrical components, load flow analysis and economic operation steady state and transient stability, Switchgear methods of extinction, Re-strilking and recovery voltage, Testing of ciruit breaker, Protective relays, Protective schemes for power system equipment. C.T. and P.T Surges in transmission lines, Travelling waves and protection.

Utilisation – Industrial drives electric motors for various drives and estimates of their rating; Behaviour of motors during starting acceleration, breaking and reversing operation; Schemes of speed control for d.c and induction motors.

Economic and other aspects of different systems of rail traction; mechanies of train movement and estimation of power and energy requirements and motor rating characteristics of traction motors, Dielectic and induction heating.

OR

Part – C (Light currents)

Communication System – Generation and detection of amplitude – frequency phase and Pulsemodulate signals using oscillators, modulators and demodulators, Comparison of modulated systems, noise problems, channel efficiency sampling theorem sound and vision broadcast transmitting and receiving system, antennas, feeders and receiving circuits, transmission line at audio radio and ultra, high frequencies.

Microwaves – Electromagnatic wave in guided media wave guide components cavity resonaters, microwave tubes and solid-state devices, microwave generator and amplifiers, filters microwave measuring techniques, microwave radiation pattern, communication and antenna systems, Radio aids to navigation.

D.C Amplifiers – Direct coupled amplifiers, difference amplifiers, choppers and analog computation.

13. GEOGRAPHY

Section- I

Principles of Geography:-

Part- A. Physical Geography:

(i) Geomorphology – Origin and evolution of the earth's crust: earth movements and plate tectonics; volcanism; cycle of erosion.- Davis and Penck; fluvial, glacial, arid and karst land-forms; rejuvenated and polycyclic land-forms.

(ii) Climatology: - The atomosphere, its structure and composition; air masses and fronts; cyclones and related phenomena; climatic classification; koeppon and Thornthwait; groundwater and hydrological cycle.

(iii) Soils and vegetation- Soil genesis, classification and distribution: ecological aspects of savanna and monsoon forest biomes.

(iv) Oceanography: - Ocean bottom relief. Relief of Indian Ocean floor. Salinity. currents and tides; ocean deposits and coral reefs;

(v) Ecosystem. – Ecosystem concept, Man's impact on the ecosystem, global ecological imbalances.

Part B. Human and Economic Geography.

(i) Devleopment of Geographical Thought: - Contributions of European and British Geographers, determinism and possiblilism; Dualism in Geography, quantitative and behavioural revolutions in geography.

(ii) Human Geography- Emergence of man and races of mankind cultural evolution of man; major cultural relams of the world; international migrations, past and present; world population-distribution and growth; demographic transtition and world population.

(iii) Settlements Geography: - Concepts of rural and urban settlements, Organs of Urbançation; Rural settlement patterns; city classifications; urban spheres of influence and the rural urban fringe, the internal structure of cities; problems of urban growth in the world.

(iv) Political Geography:- Concepts of nation and state; frontiers, boundaries, and buffer zones; concept of heartland and rimland;federalism.

(v) Economic Geography.- World economic development-measurement and problems; concept of resources, world resources, their distribution and global problems; world energy crisis; and limits to growth; world agriculture-typology and world agricultural regions; theory of agriculturaral location, world industry-theory of location of industries; world industrial patterns and problems; world trade and world trade patterns.

Section- II

GEOGRAPHY OF INDIA.

Physical Aspects: - Geological history, Physiography and drainage systems; orign and mechanism of the Indian monsoon, soils and vegetation.

Human Aspects – Tribal areas and their problems; population distribution, density and growth; population problems and policies.

Resources – Conservation and utilçation of land mineral water biotic and marine resources; ecological problems and their management.

Agriculture – Irrigation intensity of cropping, crop combinations, green revolution, agricultural land use policy, Rural economy-Animal husbandry, social forestry and household industry.

Industry: - History of industrial development; factors of location study of mineral based, agro-based and forest-based industries, industrial complexed and industrial regionalisation.

Transport and Trade – Study of the network of roadways railways, waterways, intra and inter-regional trade and the role of rural market centres.

Settlements- Rural Settlement patterns; urban development in Indian and its problems, internal structure of Indian cities; town planning, slums nad urban housing; national urbanisation policy.

Regional Development and planning. Five-years plan; multilevel planning; state, district and block level planning regional disparities in development in India.

Political Aspects.- Political problem of India, state reorgançation; the international boundary of India and related issues; India and geopolitics of the Indian Ocean area.

Geography of Bihar under the following heads: - Physiographic divisions, soils, forests, climate, pattern of agriculture, problems of drought-prone and flood affected regions and their solution, chief mineral resources-iron ore, copper, bauxite mica and coal; principal industries-iron and steel, aluminium, cement, Sugar: principal industrial regions, problems of population in Bihar, problem of tribal population and their solution; pattern of urbanisation in Bihar.

14. GEOLOGY

SECTION- I

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

(i) General Geology:

Energy in relation to Geo-dynamic activities. Origin and interior of the Earth. Dating of rocksuoy various methods and age of the Earth. Volcanoes-causes and products; volcanic belts. Earthquakes-causes, geological effect and distribution.

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

(ii) Geomorphology:

Basic concepts and significance. Geomorphic processes and parameters. Geomorphic cycles and their interpretation. Relief features; Topography and its relation to structures and lithology. Major landforms. Drainage patterns. Geomorphic features of Indian subcontinent and Chotanagpur plateau.

(iii) Structural Geology:

Stress and strain ellipsoid, and rock deformation. Mechanics of folding and faulting. Linear and planer structures and their genetic significance Petrofabric analysis, its graphic representation and application to geological problems. Tectonic framework of India.

(iv) Palacontology:

Micro and Macro-fossils. Modes of preservation and utility of fossils, General idea about classification and nomenclature. Organic evolution and the bearing of pala contological studies on it.

Morphology, classification and geological history including evolutionary trends of biachiopods, bivaleves, gastropods, ammonoids, trilobites, echinoids and corals.

Prinicpal groups of vertebrates and their main morphological characters. Vertebraes life through ages; dinosaurs: siwalik vertebrates. Evolution of horses, elephants and man, Gondwana flora and its importance.

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

(v) Stratigraphy:

Principles of Stratigraphy Stratigraphic classification and nomenclature. Standard stratigraphic scale. Detailed study of various geological systems of Indian subcontienet. Boundary Problems in Indian stratigraphy. An outline of the stratigraphy of various geological systems in their type-areas. Brief study of climates and igneous activities in Indian symmetry during geological post Palaecogeographic reconstructions.

Section – II

(Crystallography Mineralogy. Petrology and Economic Geology)

(i) **Crystallography**:- crystalline and non crystalline substances. Space groups. Lattice symmetry. Classification of crystals into 32 classes of symmentry. International system of crystallorgraphic notation. Use of stereographic projections to represent crystal symmetry. Twinning and twin laws Crystal irregularities. Application of X-Rays for crystal studies.

(ii) **Optical Mineralogy**:-

General principles of optics Isotropism and anisotropism, Concepts of optical indicatrix, pleochroisn, interference colours and extinction. Optic orientation in crystals. Dispersion. Optical accessories.

(iii) Minerlogy:

Elements of crystal chemistry-types of bondings Ionicradi, coordination number, isomorphism, polymorphism and pseudomorphism. Structural classification of silicates. Detailed study of rock-forming minerals-their physical, chemical and optical properties and uses, if any, study of the alteration products of these minerals.

(iv) Petrology:-

Magma, its generation, nature and composition. Simple phase diagrams of binary and ternary systems, and their significance, Bowen's Reaction Prinicple. Magmatic differentiation; assimilation, Textures and structures, and their petrogenetic significance. Classificaiton of igneous rocks. Petrography and petro genesis of important rock-types of India Genesis of granites; charnockites; anorthosites; and alkaline rocks.

Processes of formation of sedimertary rocks. Diagenesis and lithification. Textures and structures of sedimentary rock and their significance. Classifcations of sedimentary rocks elastic and non-elastic. Heavy minerals and their significance. Elementary concept of depositional environments. sedimentary facies and provenance. Petrography of common sedimentary rock types.

Agents of metamorphism. Types of metamorphism. Metamorphic grades, zones and facies. ACF, AKF and AFM diagrams. Textures, structures and nomencluature of metamorphic rocks. Petrography and petrogenesis of important metamorphic rock types.

(v) **Economic Geology:**

Concept of ore, ore mineral and gangue, tenor of ores. Processes of formation of mineral deposits. Common forms and structures of ore deposits. Classificaion of ore deposits. Control of ore deposition Metallogenetic enochs. Study of important metallic an no-metallic deposits oil and and natural gas fields and coalfields of India. Mineral wealth of Bihar, Mineral economics, National Mineral policy Conservation and utilçation of minerals.

(vi) Applied Geology:

Essentials of prospecting and exploration teachinques. Principal methods of mining sampling redressing and benefication. Application of geology in Engineernig works.

Elements of soil and groundwater geology. Groundwater Provinces of Bihar. Use of Air related Diagrams in Geological Exploration.

15. HISTORY

Section- I

Part A- History of India (Down to A.D. 750)

1. The Indus Civilisation

Origins extent, characteriatic features, major cities, trade and contacts, causes of decline, survival and continuity.

2. The Vedic age

Vedic literature. Geographical area known to vedic texts. Differences and similarities between Indus Civilisation and Vedic culture. Politcal, social and economic patterns.Major religious ideas and rituals.

3. The Pre-Maurya Period

Religious movements (Jainism. Budhism and other sects). Social and economic conditions. Republics and growth of Magadha imperialism.

4. The Maurya Empire

Sources, rise, extent and fall of the empire administration .Social and economic conditions. Ashoka's policy and reform, art.

5. The Post-Maurya Period (200 B.C-300 A.D).

Prinicipal dynasties in Northern and Southern India. Economy and Society, Sanskrit, Prakrit and Tamil, Religion (Rise of Mahayana and theistic cults). Art (Gandhara, Mathura and other schools). Contacts with Central Asia.

6. The Gupta Age

Rise and fall of the Gupta Empire, the Vakatakas. Administration, Society, economy, literature, art and religion. Contacts with South Asia.

7. Post-Gupta Period (B.C 500-750 A.D)

Pushy-bhutis. The Muakharis. The later Guptas. Harshavardhana and his times. Chalukyas of Badami. The Pallavas society. administration and art. The Arab conquest.

8. General review of science and technology, education and learning.

Part B- Medieval India

India: 750 A.D. to 1200 A.D

I. Political and social conditions: the Rajputs their polity and social Structure, Land structure, and its impacts on society.

II. Trade and Commerce.

III. Art, Religion and Philosophy, Sankaracharya.

IV. Maritime activities, contacts with the Arabs, mutual, Cultural impacts.

V. Rashtrakutas, their role in History- Contribution to art and culture. The chola Empire Local Self-Government, features of the Indian village system society, economy, art and learing in the South.

VI. Indian Society on the eve of Mahmud of Ghazni's campaigns, Al-Biruni's observations.

INDIA: 1200 – 1765

VII. foundation of the Delhi Sultante in Northern India, causes and circumstances, its impact on the Indian society.

VIII. Khilji Imperialism, significance and implications, administrative and economic regulations and their impact on State and the people.

IX. New orientation of State policies and administration principles under Muhamed Bin Tughluq. Religious policy and public works of Firoz Shah.

X. Disintegration of the Delhi Sultanate; causes and its effects on the Indian policy and society.

XI. Nature and character of State; political ideas and institutions. Agrarian structure and relations, growth of urban centres, trade and commerce, conditions of artisans and peasants, new crafts, industry and technology, Indian medicines.

XII. Influence of Islam on Indian culture. Muslim mystic movements, nature and significance of Bhakti saints, Maharashtra Dharma, role of the Vaisnave revivalist movement social and religious significance of the chaitanya movement, impact of Hindu society on Muslim social life.

XIII. The Vijayangar Empire: its origin and growth contribution to art, literatiure and culture; social and economic conditions, system of administration, break-up of the Vijayanagar Empire.

XIV. Sources of History: important chronicles. Inscriptions and Travellers Accounts.

XV. Establishment of Mughal Empire in Northern India: political and social conditions in Hindustan on the eve of Babur's invasion, Babur and Humayun Establishment of the Portuguese control in the Indian ocean, its political and economic consequences.

XVI. Sur Administration, political, revenue and military administration.

XVII. Expansion of the Mughal Empire under Akbar: political unification: new concepts of monarchy under Akbar: Akbar's religio-political outlook: relations with the non-Muslims.

XVIII. Growth of regional languages and literature during the medieval period development of art and architecture.

XIX. Political ideas and institutions; nature of the Mughal State, land revenue administration; the Mansabdari and the Jagirdari systems, the landed structure and the role of the Zamindars, agrarian relations, the military organisation.

XX. Aurangzeb's religious policy; expansion of the Mughal Empire in Deccan; revolts against Aurangzeb-Character and consequences.

XXI. Growth of urban centres; industrial economy urban and rural; foreign trade and commerce. The Mughals and the European trading companies.

XXII. Hindu-Muslim relations; trends of integration; composite culture (16^{th} to 18^{th} centuries).

XXIII. Rise of Shivaji, his conflict with the Mughals; administration of Shivaji, expansion of the Maratha power under the Peshwas (1707-1761), Maratha political structure under the First Three Peshwas; Chauth and Sardeshmukhi, Third Battle of Panipat, causes and effects; emergence of the Maratha confederacy, its structure and role.

XXIV. Disintegration of the Mughal Empire, emergence of the new Regional States.

Section- II

Part A Modern India

1. Historical Forces and Factors which led to the British conquest of India with special reference to Bengal, Maharashtra and Sind resistance of Indian powers and causes of their failure. ……
2. Evolution of British Paramountey over princely States.
3. Stages of colonialism and changes in Administrative structure and policies. Revenue, Judicial and Social and Educational and their linkages with British colonial interests.
4. British economic policies and their impact- Commercialisation of agriculture Rural indebtedness, growth of agricultural labour. Destruction of handicraft industries. Drain of wealth, growth of modern industry and rise of a capitalist class. Activities of the Christian Missions.
5. Efforts at regeneration of Indian society. Socio-religious movements, social religious, political and economic ideas of the reformers and their vision of future, nature and limitation of 19th centure "Renaissance". Caste movements in general with special reference to South India and Maharashtra, tribal, revolts, specially in Central and Eastern India.
6. Civil rebellions, Revolt of 1857, Civil Rebellions, and peasant revolts with special reference to Indigo revolt. Deccan riots and Mapplia uprising.
7. Rise and growth of Indian National Movement. – Social basis of Indian nationalism policies. Programme of the early nationalists and militant nationalists militant revolutionary group terrorists. Rises and growth of communalism; emergence of Gandhiji in Indian politics and his techneques of mass mobilisation. Non-co-operation, civil disobedience and Quit India Movements, trade union and peasant movements. State (s) people movements, rise and growth of left-wing within the Congress- The Congress, Socialists and Communists; British official response to National Movement. Attitude of the Congrsess to constitutional chages, 1909-1935; Indian National Army Naval Mutiny of 1946, the partition of India and achievement of freedom.

Part- B

WORLD HISTORY (1500 - 1950)

A. Geographical Discoveries. – Decline of feudalism; beginnings of capitalism.
Renaissance and reformation in Europe.
The new absolute monarchies – Emergence of the Nation State
Commercial revolution in Western Europe – Mercantilism
Growth of Parliamentray institutions in England.
The Thirty Year's War. Its significance in European History.
Ascedancy of France.
B. The emergence of a scientific view of the World. The age of Enlightenment.
The American Revolution – Its significance.
The French Revolution and Napoleonic Era (1789 - 1815). Its Significance in World History.
The growth of liberalism and democracy in Western Europe (1815 - 1914)
Scientific and technological background to the Industrial revolution – stages of the Industrial Revolution in Europe.
C. Consolidatinon of large nation States- The unification of Italy – the founding of Socialist and labour Movement in Europe.
The German Empire.
The American Civil War.
Colonialism and Imperialism in Asia and Africa in the 19th and 20th centuries.
China and the Western Powers.
Modernisation of Japan and its emergence as a great power.
The European powers and the Ottaman Empire (1815 - 1914)
The First World War – The economic and social impact of the war – the peace of Paris, 1919.
D. The Russian Revolution, 1917 Economics and Social Reconstruction in soviet Union.
Rise of National Movements in Indonesia, China and Indo-China.
Rise and establishment of Communism in China.
Awakeing in the Arab World- Struggle for freedom and reform in Egypt Emegence of Modern Turkey Kamal Ataturk– The rise of Arab nationalism.
World Depression of 1929 -32.
The new deal of Franklin D. Roosevelt.
Rise of Militarism in Japan.
Orgins and impact of Second World War.

16. LABOUR AND SOCIAL WELFARE

Section- I

LABOUR LEGISLATION AND LABOUR ADMINISTRATION

1. Principles of Labour Legislation kinds of Labour Legislation.
2. A brief history of labour legislation in India.
3. Provisions relating to labour in the Indian Constituion.
4. The following labour laws as amended up-to-date main provisions and evaluation:-

(a) Factories Act, 1948.
(b) Minimum Wages Act, 1948 – Working in Bihar.
(c) Payment of Wages Act, 1936.
(d) Equal Remuneration Act, 1976.
(e) Workmen's Compensation Act, 1923.
(f) Maternity Benefit Act, 1961.
(g) Employees State Insurance Act, 1948.
(h) Payment of Gratuity Act, 1972.
(i) Child Labour (Prohibition and Regulation) Act, 1986.
(j) Beedi and Cigar Workmen (Conditions of Employment) Act, 1966.
(k) Bihar Shops and Establishments Act, 1953.

5. International Labour Organisation – Composition – Activities – Creation of International Standards of Labour-Influence on Indian Labour Legislation.
6. Labour Administration in Bihar.

Section- II

INDUSTRIAL RELATIONS AND SOCIAL WELFARE

I. Industrial Relations and Trade Unions with Reference to India and Bihar.

(a) Industrial relations – concept, scope, main aspects.
(b) Industrial dispute and strikes – forms, causes and prevention –different methods of settling industrial dispute – collective bargaining – Industrial Dispute Act, 1947.
(c) Worker's participation in management – objectives – institutions – present position – causes of failure in India.
(d) Trade Unions in India – brief history – kinds – objectives and methods of achievement – structure and Government – political affiliation and leadership – problem of rivalry and recognition – trade Unions Act, 1925.
(e) Code of discipline and code of conduct.

II. Social welfare and social security.

(a) Social security – meaning – scope – nature and methods.
(b) Unemployment – meaning – kinds courses – measures for removing – special employment programmes in India.
(c) Poverty – meaning – kinds – extent –causes measures for eradicating – special Governments, programme for eradicating rural poverty in India and Bihar.
(d) Child welfare – problems of children – welfare measures for them.
(e) Women welfare – problems of women – welfare measures of them.
(f) Welfare of Scheduled Castes and Schedualed Tribes – problems – welfare measures.
(g) Prohibition - position in Bihar
(h) Prostitution – nature – causes– effects – measures for removing.
(i) Beggary- nature courses – situation in Bihar.
(j) Social security programmes of the Government of Bihar old-age pension unemployment Dole– Group Insurance–rehabilitation of bonded labourers.

17. LAW

Sectiion– I

Part- I Constional law of India.

1. Nature of the Indian Constitution' the distinctive features of its federal character.
2. Fundamental Right; Directive Principles and their Relationship with Fundamental Right; Fundamental Duties.
3. Right to Equality.
4. Right to Freedom of Speech and Expression.
5. Right to Life and Personal Liberty.
6. Religious, Cultural and Educational Rights.
7. Constitutional position of the President and relationship with the Council Ministers.
8. Governor and his powers.
9. Supreme Court and high Courts, their powers and jurisdiction.
10. Unon Public Service Commission and State Public Service Commission:

their powers and functions.

11. Principles of Natural Justice.
12. Distribution of Legislative powers between the Union and the States.
13. Delegated legislation its constitutionality. Judicial and legislative controls.
14. Administrative and Financial Relations between the Union and the States.
15. Trade. Commerce and Intercourse in India;
16. Emergency provisions.
17. Constitutional safeguards to Civil Servants.
18. Parliamentary Privileges and immunities.
19. Amendment of the Constitution.

Part- II. INTERNATIONAL LAW.

1. Nature of International Law.
2. Sources: Treaty; Custom, General Principles of Law recognçed by civilçed nations. Subsidiary means for the determination of Law Resolutions of International organs and regulations of Specialçed Agencies.
3. Relationship between International Law and Municipal Law.
4. State Recognition and State Succession.
5. Territory of States: modes of acquisition, boundaries, International Rivers.
6. Sea: Inland Waters, Territorial sea, Contiguous Zone, Continenatal shelf, Exclusive Economic Zone and ocean beyond national jurisdiction.
7. Air space and aerial navigation.
8. Outer space: Explotation and use of Outer Space.
9. Individuals. Nationality Statelessness; Human Rights and Procedures available for their enforcement
10. Jurisdiction of States: bases of jurisdiction, immunity from jurisdiction.
11. Extradition and Asylum.
12. Diplomatic Missions and Concular Posts.
13. Treaties: Formation, application and termination.
14. State Responsibility.
15. United Nations: Its Principal organs, powers and functions.
16. Peaceful settlement of disputes.
17. Lawful recourse to force; aggression, self defence, intervention.
18. Legality of the use of nuclear weapons; ban on testing of nuclear weapons; Nuclear Non-Proliferation Treaty.

Section- II

Part – I. Law of crimes and Torts:

Law of Crimes

1. Concept of crime: actus reus, mens rea, means rea in statutory offences, punishments mandatory sentences preparation and attempt.
2. Indian penal Codes:

(a) Application of the Code.
(b) General exceptions.
(c) Joint and constructive liability.
(d) Abetment.
(e) Criminal conspiracy.

(f) Offences against the State.
(g) Offences against public tranquility.
(h) Offences by or relating to public servants.
(i) Offences against human body.
(j) Offences against property.
(k) Offences relating to Marriage; Cruelty by husband or his relatives to wife.
(l) Defamation.
3. Protection of Civil Rights Act, 1955.
4. Dowry prohibition Act, 1961.
5. Prevention of Food Adulteration Act, 1954.

Part – II. Law of Torts

1. Nature of tortuous liability.
2. Liability based upon fault and strict liability.
3. Statutory liability.
4. Vicrious liability.
5. Joint Tort-feasors
6. Remedies.
7. Negligence.
8. Occupier's liability and liability in respect of structures;
9. Detenu and conversion.
10. Defamation.
11. Nuisance.
12. Conspiracy.
13. False Imprisonment and Malicious Prosecution.

Part III. Law of Contracts and Mercantile Law.

1. Formation of contract.
2. Factors vitiating consent.
3. Void, voidable, illegal and unenforceable agreements.
4. Performance of contracts.
5. Dissolution of contractual obligations, frustration of contracts.
6. Quasi. contracts.
7. Remedies for breach of contract.
8. Sale of goods and hire purchase.
9. Agency.
10. Formation and dissolution of Partnersrip.
11. Negotiable Instruments.
12. The Banker-customer relationship.
13. Government control over private Companies.
14. The Monopolics and Restrictive Trade Practices Act, 1969.
15. The Consumer Protection Act, 1986

18. MANAGEMENT

Section- I

The candidate should make a study of the development of the field of management as a systematic body of knowledge and acquaint himself adequately with the contributions of leading authorities on the subject. He should study the role, function and behaviour of a manager and relevance of various concepts and theories to the Indian context. Apart from these general concepts, the candidate should study the environment of business and also attempt to understand the tools and techniques of decision making.

Organisational Behaviour and Management Concepts, Significance of social psychological factors for understanding organçational behaviour, Relevance of theories of motivation; Contribution of Maslow. Herzberg, McGregor, McClelland and other leading authorities, Research studies in leadership. Management by Objectives. Small group and intergroup behaviour. Application of these concepts for understanding the managerial role, conflict and cooperation, work norms and dynamics of organçational behaviour. Organisational change.

Organisational design: Classical, neo-classical and open systems theories of organçation, Centralisation, decentralçation, delegation, authority and control. Organisational structure, systems and processes, strategies,

policies and objectives, Decision making communication and control. Management information system and role of computer in management.

Economic Environment.

National Income, analysis and its use in business forecasting. Trends and structure in Indian Economy, Government programmes and policies. Regulatory Policies: monetary fiscal and planning, and the impact of such macro-policies on enterprise decisions and plans-Demand analysis and forecasting, cost analysis, pricing decisions under different market structures – pricing of joint products, and price discrimination – capital budgeting – applications under Indian conditions. Choice of projects and cost benefit analysis choice of production techniques.

Quantitative Methods

Classical Optimçatoin: maxima and minima of single and several variables; optimçation under constraints – Applications. Linear Programming: Problem formulation – Graphical Solution Simplex Method Duality – post optimality, analysis – Applications of integar Programming and dynamic Programming – Formulation of Transportation and assignement Models of linear Programming and methods of solution.

Satistical Methods. Measures of Central tendencies and variations – Application of Binominal. Poison and Normal distributions. Time series – Regression and correlation Tests of Hypotheses – Decision marking under risk: Decision Trees Expected Monetary Value – Value of Information – Application of Bayes Theorem to posterior analysis. Decision making under uncertainty. Different criteria for selecting optimum stragegies.

Section- II

Part- I – Marketing Management

Marketing and Economic Development – Marketing Concept and its applicability to the Indian economy – Major tasks of management in the context of developing economy – Rural and Urban marketing, their prospects and problems.

Planning and Strategy in the context of domestic and export marketing concept of marketing mix- Market Segmentation and product differentiation strategies – Consumer Motiation and Behaviour – Consumer Behavioural Models Product. Brind distribution Public distribution system price and promotion.

DECISIONS- Planning and control of marketing programmes – Markeing research and models – Sales Organisational dynamic –Marketing Information system. Marketing audit and control.

Export incentives and promotional strategies – Role of Government, trade association and individual organçation – problems and prospects of export marketing.

Part- II – Production and Materials Management.

Fundamentals of production from Management point of view. Types of Manufacturing systems continuous-repetitive, intermittent. Organising for Production, Long range, forecast and aggregate production planning. Plant Design: Process planning, plant sçe and scale of operations, location of plant, layout of physical facilities. Equipment replacement and maintenance.

Functions of production planning and Control, Routing, Loading and Scheduling for dirrerent types of production systems. Assembly line Balancing, Machine line Balancing.

Role and importance of materials management, Material handling, Value analysis, Quality control waste and scrap disposal, make or buy decisions, Codificaiton, Standardisation and spare parts inventory. Inventory control – ABC Analysis, Economic order quantity, Recorder point, Safety stock. Two Bin system. Waste management DGS & D purchase process and procedure.

Part- III – Financial Management

General tools of financial Analysis: Ratio analysis, funds flow analysis, cost volume-profit analysis, cash budgeting, financial and operative leverage.

Investment Decision: Steps in Capital expenditure managements, criteria for investment appraisal, cost of capital and its application in public and private secotrs. Risk analysis in investment decisions, organçational evalution of capital expenditure management with special reference to India.

Financing decision: Estimating the firms of financial requirements, financial structure determinations, capital markets, institutional mechanism for funds with special reference to India. Security analysis leasing and sub-contracting.

Working Capital Managements: Determining the sçe of working capital, managing the managerial attitude towards risk in working capital, management of cash, inventory and accounts receivables, effects of inflation on working capital management.

Income Determination and Distribution: Internal financing, determination of divided policy, implication of inflationary tendencies in determining the dividend policy, valuation and dividednd policy.

Financial management in public sector with special reference to India.

Performance budgeting and principles of financial accounting. Systems of management control.

Part – IV Human Resource Management.

Characteristics and significance of Human Resources – Personnel policies – Manpower, policy and planning – Recruitment and selection Technique – Training and Development – Promotions, and Transfer: Performance Appraisal – Job Evaluation: Wage and Salary Administration; Employee Morals and Motivation. Conflict Management. Management of Change and Development.

Industrial Relations Economy and Society in India: Worker profile and Management Styles in India; Trade Unionism in India: labour Legislation with special reference to Industrial Disputes Act: Payment of Bonus Act: Trade Unins Act: Industrial democracy and Workers participation in Menage indication. Discipline and Grievances Handling in Industry.

19. MATHEMATICS

SECTION- I

Candidates shall answer not more than three questions from each section.

Linear Algebra.

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

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

Orthogonal, symmetrical, skew-symmetrical, unitary, Hermitian and Skew-Hermitian matrices – their eigenvalues, orthogonal and unitary reduction of quadric and Hermitian forms, positive definite quadratic forms. Simultaneous reduction.

Calculus.

Real numbers, limits, continuity, differentiability, Mean-Value theorem, Taylor's theorem, indeterminate forms, Maxima and Minima, Curve Tracing, Asymptotes, Functions of several variables, partial derivatives. Maxima and Minima, Jacobian. Definite and indefinite integrals, double and triple intergrals (techniques only). Application to Beta and Gamma functions. Areas, Volumes, Centre of gravity.

Analytic Geometry of two and three dimensions:

First and second degree equations in two dimensions in Cartesian and polar conrdinates. Plane, Sphere, Paraboloid, Ellipsoid. Hyperboloid of one and two sheets and their elementary properties. Curves in space, curvature and torsion. Frenet's formula.

Differential Equations.

Order and Degree and a differential equation, differential equation of first order and degree, variables separable. Homogeneous, Linear and exact differential equations. Differential equations with constant coefficients. The complementary function and the particular integral of e^{ax}, $\cos^{ax}$, $\sin^{ax}$,x^m, e^{ax} , cosbx, e^{ax}, sin bx.

Vector, Tensor, Statics, Dynamics and Hydrostatics:

(i) Vector Analysis – Vector Algebra, Differential of Vector function of a scalar variable, Gradient, Divergence and Curl in Cartesian Cylindrical and spherical co-ordinates and their physical interpretation. Higher order derivatives. Vector indentities and Vector equations, Gauss and Stocks theorems.

(ii) Tensor Analysis – Definition of Tensor, transformation of co-ordinates, contravariant and covariant tensor. Addition and multiplication of tensors, contraction of tensors, Inner product, fundamental tensor, chirstofel symbols, covariant differentiation. gradient, Curl and divergene in tensor notation.

(iii) Statics – Equilibrium of a system of particles, work and potential energy. Friction, Common catenary. Princlple of Virtual Work stability of equilibrium, Equlibrium of forces in three dimensions

(iv) Dynamics – Degree of freedom and constraints. Rectilinear motion. Simple harmonic motion. Motion in a plane. Projectiles. Constrained motion. Work and energy motion under implusive forces. Kepler's laws. Orbits under central forces. Motion of varying mass. Motion under resistance.

(v) Hydrostatics – Pressure of heavy fluids. Equilibrium of fluids under given system of forces Centre of pressure. Thrust on curved surfaces, Equilibrium and pressure of gases, problems relating to atmosphere.

SECTION- II

Algebra, Real Analysis, Complex Analysis, Partial Differential equations.

Mechanics,, Hydrodynamics, Numerical Analysis. Statistics including probability operational research.

Algebra.

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

Real Analysis.

Metric spaces, their topology with special reference to Rn sequence in a metric space, Cauchy sequency Completeness, Completion Continuous functions, Uniform Continuity, Properties of Continous function on Compact sets. Riemanh Stieltjes intergral, Improper intergrals and their conditions of existence. Differentiation of functions of several variable, Impicit function theorem, maxima and minima, Absolute and conditional convergence series of real and complex terms, Re-arrangement of series. Uniform convergence, Infinite products, Continuity, differentiability and integrability for series, Multiple intergrals.

Complex Analysis.

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

Partial Differential Equations.

Formations of partial differential equations. Types of intergrals of partial differential Equations of first order Charpits method. Partial differential equation with constant co-efficient.

Mechanics.

Generalised co-ordinates, Constrainst, Holonomic and Non-holonomic systems, D' Alembert's principle and Lagranges equations. Moment of Inertia, Motion of rigid bodies in two dimension.

Hydrodyanamics.

Equation of continuity, Momentum and energy. Inviscid Flow Theory – Two dimensional motion, streaming motion, Sources and Sinks.

Numerical Analysis.

Transcendental and Polynomial Equations – Methods of tabulation, bisection, regula-talsi, secant, and Newton-Raphson and order of its convergence.

Interpolation and Numerical differentiation – Polynomial interpolation with equal or unequal step sçe. Spline interpolation – Cubic splines. Numerical differentiation formulae with error terms.

Numerical integration – Problems of approximate guardrative guardrature formulae with equispaced arguments. Caussina quardrature convergence.

Ordinary differential equations – Eulers method, Multistep-predictor corrector methods – Adam's and Milne's method, convergence and stability, Runge – Kutta methods.

Probability and Statistics.

1. Statistical methods – Concept of statistical population and readom sample. Collection and presentation of data. Measure of location and dispersion. Moments and shepard's correction comulants. Measures of Skewness and Kurtosis.

Curve fitting by least squares regression, correlation and correlation ratio. Rank correlation, Partial correlation co-efficient and Multiple correlation co-efficient.

2. Probability – Discrete sample space, Events, their union and intersection, etc., Probability – Classical relative frequency and exiomatic approaches. Probability in continuum probability space conditional probability and independence, Basic laws of probability, Probability of combination of events, Bayes theorem, Random variable probability function, Probability density function. Distributions function, Mathematical expectation. Marginal and conditional distributions, Conditional expectation.

3. Probability distributions – Dinomial, Poisson Normal Gamma, Beata. Cauchy, Multinomial, Hypergeometirc, Negative Binomial, Chebychey's Lemma. (Weak) law of large numbers, Central limit theorem for independent and identical varieties, standerd errors, Sampling distribution of T.F and Chi-square and their uses in tests of significance large sample tests for mean and proportion.

Operational Research.

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

Theory of Queues – Analysis of steady-state and transient solution for queueing system with poission arrivals and exponential service time.

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

20. MECHANICAL ENGINEERING

Section- I

Statics – Equalibrium in three dimension suspension cables, principle of virtual work.

Dynamics – Relative motion coriolis force motion, of a rigid body. Gyrsocpic motion impulse.

Theory of Machines – Higher and lower pairs, inversions, sterign mechanisms. Hooks joint velocity and acceleration of links, interia forces. Cama conjugate action of gearing and interference, gear trains epicyclic gears. Clutches, belt drives, brakes dynamometers, flywheels governors. Balancing of rotating and reciprocating masses and multicylinder engines. Free, forced and damped vibrations for a single degree of freedom. Degrees of freedom critical speed and whirling of shafts.

Mechanics of solids. – Stress and strain in two dimension. Mohr's circle. Theories of failure, deflection of beams. Buckling of columns, combined binding and torsion castiglapo's theorem. Thick cylinders rotating disks Shrink fit. Thermal stresses.

Manufacturing Science – Merchant's theory Taylors equation. Machineability. Unconventional machining methods including EDM, ECM and ultrasonic machining. Use of lesers and plasms. Analysis of forming processes high velocity forming expolsive forming. Surface roughness, gauging comparators, Jigs and Fixtures.

Production Management- Work simplification work sampling value engineering. Line balancing, work station design, storage space requirement. A B C analysis. Economic order, quanitity including finite production rate. Graphical and simplex methods for linear programming; transportation model, elementary quieing theory. Quality control and its uses in product design. Use of X, R, P (Sigma) and C charts. Single sampling plans, operating characteristic curves, average sample sçe Regression analysis.

Section- II

Thermodynamics – Applications of the first and second laws of thermodynamics. Detailed analysis of thermodynamics cycles.

Fluid Machanies. – Continuity, momentum and energy equations. Velocity distribution in laminar and turbulent flow. Dimensional analysis. Boundary layer on a flat plate. A diabatic and isentrophic flow. Mach number.

Heat Transfer – Critical thickness of insulation conduction in the presence of heat sources and sinks. Heat transfer from fines. One dimensional unstuady conducation. Time constant for the mocouples. Momentum and energy equations for boundary layers on a flat plate. Dimensionless number free and forced convection. Boiling and condensation nature of radiant heat. Stefan-Boltz-Mann Law. Configuration factor logarithmic mena temperature difference. Heat exchanger effectivencess and number of transfer units.

Energy Conversion – Combustion phenomenon in C.I and S.I engines carburation and fuel injection Selection of pumbs classification of hydraulic turbines, specific speed. performace of compressor. Analysis of steam and gas turbines. High pressure boilers, Unconventional power systems, including Nuclear power and M H D systems. Utilisation of solar energy.

Environmental Control – Vapour compression absorption, steam jet and air refrigeration systems, properties and characteristics of important refregerants. Use of phychometric chart and comfort chart, estimation of cooling and haring loads. Calculation of supply air state and rate. Air conditioning plants lay-out.

21. PHILOSOPHY

Section – I

Metaphysics and Epistemology

Candidate will be expected to be familiar with theories types of Epistemology and metaphysics – India and Western – with special reference to the following

(a) Western – Idealism; Realism; Absolutism Empiricism Rationalism; Logilca 'I' Positivism; Anaysis; Phenomenology; Existentialism and pragnatism.

(b) India- Pramanans and pranaya; Theories of Turth and error, philosophy of language and meaning; Telteories of reality with reference to main system (Orthodox and Heterodox) of Philosophy.

Section- II

Socio political philosophy and philosophy of Religion

1. Nature of philosophy its relation to life, thought and culture.
2. The following topics with special reference to the Indian context including Indian Constitution:-

Political Ideologies; Democracy Socialism, Fascism, Theocracy, Communism and Sarvodaya.

Methods of Political Action: Constitutionalism, Revolution, Terrorism and Satyagraha.

3. Tradition, change and modernity with reference to Indian social Institutions.
4. Philosophy of Religious language and meaning.
5. Nature and scope of philosophy of religion. Philosophy of religion with special reference to Buddhism, Jainism, Hinduism, Islam ,Christianity and Sikhism.

(a) Theolgoy and philosophy of Religion.

(b) Foundations of religious belief, Reason Revelation Faith and Mysticism.

(c) God Immortality of Soul, Liberation and Problem of Evil and sin.

(d) Equlity, Unity and universality of Religions; Religious TLolerance; Conversion Secularism.

6. Moksha – Paths leading to Moksha.

22. PHYSICS

Section-I

Mechanics, Thermal Physics and Wave and Oscillations

1. Mechanics:-

Conservation Laws. Collisions, impact parameter, scattering cross-section. Centre of mass and Lab-systems with transformation of physical quantities, Rutherford Scattering. Motion of a rocket under constant force field. Rotating formes of reference, Coriolis force, Motion of rigid bodies, Angular momentum, Torque and procession of a top, Gyroscope. Central forces, Motion under inverse square law, Kepler's Laws, Motion of Satellites (including geostationery). Galilean Relativity, Speical Theory of Relativity, Micheloson-Morley Experiement, Lorentz Transformation – addition theorem of velocities, Variation of mass with, Velocity, Mass Energy equivalence, Fluid dynamics, streamlines, turbulence, Beronullis Equation with simple applications.

2. Thermal Physics:

Laws of thermodynamics, Entroypy, Carnot's cycle, Isothermal and Adiabatic changes, Thermodynamic Potenials Maxwell's relations. The Clausius-Clapey ren equation reversible cell, Joule-Kelvin effect etc. fan boltazmann Law, Kinetic Theory of Gases, Maxwell's Distribution Law of velocities, Equipartition of energy, Specific heats of gases Mean free path, Brownian Motion. Black body radiation, specific heat of solids – Einstean and Dbye theories, Wein's Law, Plankc's Law, solar constant. Thermalionçation and Stellar spectra. Production of law temperatures using adrabatic remagnalçation and deduction refrigeration, concept of negative temperature.

3. Waves and Oscillations.

Oscillations, Simple harmonic motion, stationary and travelling waves, Damped harmonic motion, forced oscillation and Resonance. Wave equation, harmonic Solutions, Plane and Spherical waves, Superposition of waves, phase and group velocities, Beats. Huygen's principle, Interference. Differaction-Fresnel and Fraunhofer. Diffraction by statight edge, single and multiple slits, Re-solving power of grating and Optical Instruments. Ravleigh Criterion. Polarçation, Production and detection of polarçed light (linera, circular and elliptical). Laser sources (Helium-Neon, Ruby and semiconductor diode) Concept of spatial and temporal coherence diffraction as a fourier transformation. Fresnel and Fraunhofer diffraction by rectangular and circular apertures, Holography; theory and applications.

Section- II

(Electricity and Magnetism, Modern Physics and Electronics)

1. Electricity and Magnetism:-

Columb's Law, Electric field. Gauss's law, Electric-potential Possion and laphlace equation for a homogeneous dietectric, uncharged conducting sphere in a uniform field, point chage and infinite conducting plane. Magnetic Shell Magnetic induction and field strength. Blot-Savart law and applications. Electromagnetic induction, Faraday's and Leæ's laws, self and mutual inductances. Alternating currents. L.C.R. circuits series and parallel resonace circuits, quality factor. Kirchoff's laws with application. Maxwell's equations and electromagnetic waves, Transverse nature of electromagnetic waves, Poynting vector. Magnetic fileds in matter – dia para, ferro antiferro and ferri magnetism (qualitative approach only).

2. Modern Physics:

Bohr's theory of hydrogen atom. Electron spin, optical and X-ray Spectra. Stern – Gerlach experiment and spatical quantçation. Vector model of the atom, spectral terms, fine structure of spectral fines. J-J and L.S coupling Zeeman effect, Paull's; oxclusion principle, spectral term of two equivalent and non equivalent electorns. Gross and fine structure of electroic band Spectra. Raman effect. Phototelectric effect. Compton effect, debroglie waves. Wave particle duality and uncertainty principle. Schrodingr wave equation with application to (i) particle in a box (ii) motion across a step potential, one dimentional harmonic oscillator eigen values and eigon functions. Uncertainty Priciple Radioactivity, Alpha, Beta and Gamma radiations. Elementary theory of the alpha decay. Nuclear binding energy. Mass spectroscopy, Semi empirical mass fourmula. Nuclear fission and fusion. Elementary Reactor physics Elementary particle their classification. Strong and weak electro magnetic intractions. Particle accelerators; cyclotron. Linear accelerations. Elementary ideas of super conductivity.

3. Electronics:

Band theory of Solids- Conductors, insulators and semiconductors. Intrinsic and extrinsic semiconductor P.N junction, Thermistor, Zenner diodes reverse and forward biased P. N Junction, Solar cell use of diodes and transistors for rectification, emplification, oscillation, modulation and detection of r.f. waves. Transistor receiver, Television Logic Gates.

23. POLITICAL SCIENCE AND INTERNATION RELATIONS

Section-I

Part-A

POLITICAL THEORY:

1. Main feature of ancient Indian Political Thought ; Manu and Kautilya; Ancient Greek thought Plato. Aristotle; General characteristics of European medieval political thought; St. Thomas Aquinas, Marsiglip of padua; Machavelli. Hobbes, Locke. Montesq-uien, Rousseau, Bentham, J.S. Mill, T.H.Green, Hegal Marx, Lenin and Mao-se Tung.

2. Nature and scope of political Science; Growth of political Science as a discipline. Traditional Vs. Contemporary approaches; Behaviourlism and Post-behavioural development; Systems theory and other recent approaches to political analysis, Marxist approach to political analysis.

3. The emergence and nature of the modern State: Sovereignty; Monistic and Pluralistic analysis of sovereignty; Power Authority and Legitimacy.

4. Political obligation: Resistance and Revolution; Rights, Liberty, Equality, Justice.

5. Theory of Democracy.

6. Liberalism, Evolutionary Socialism (Democratic and Febian); Marxian Socialism; Fascism .

Part- B

GOVERNMENT AND POLITICS WITH SPECIAL REFFRENCE TO INDIA.

1. Approaches to the study of Comparative Politics; Traditional, Structural Functional approach.

2. Political Institution; The Legislature, Executive and Judiciary; Parties and Pressure Groups; Theories of party system. Lenin, Michels and Duverger; Electoral System; Bureaucracy- weber's view and Modern critiques of weber.

3. Political Process: Political Socialisation, Modernçation and Communication; the nature of the non-western Political Process; A general study of the Constitutional and Political Problems affecting Afro-Asian Societies.

4. Indian Political system: (a) The Roots; colonialism and nationalism in India; A general Study of modern Indian Social and Political thought; Raja Ram Mohan Roy, Dadabhai Nauroji, Tilak, Sri Aurobindo, Iqbal, jinnah, Gandhi, B.R.Ambedkar, M.N.Roy, Nehru and Jay Prakash Narain.

(b) The Structure: Indian Constitution, Fundamental Rights and Directive Principles; Union Government; Parliament, Cabinet, Supreme Court and Judicial Review; Indian Federalism Centre-State relation, State Government role of the Governor; Panchayati Raj, Panchayati Raj System in Bihar.

(c) The Functioning: Class and Caste in Indian Politics, Politics of regionalism, linguism and Communalism. Problems of Secularçation of the Policy and national intergration . Political elities; the changing Composition; Political Parties and Political Participation; Planning and Developmental administration, Socio-economic changes and its impact on Indian democracy, Regionalism with Special reference to Jharkhand Movement in Bihar.

Section- II

PART-I

1. The nature and functioning of the Sovereignation State System.

2. Concepts of International Politics; Power; National Interest; Balance of Power, "Power vaccum."

3. Theories of International Politics, The realist theory; System theory: Decision making.

4. Determinants of foreign Policy: National Interest; Ideology; Elements of National Power (including nature of domestic socio-political institution).

5. Foreign Policy: Choices – Imperialism; Balance of Power; Alleg hances; Isolationalism: Nationalistic Universalism (pax Britiannica pax Amricana Pax-Sovietica); The "Middle Kingdom" Complex of China; Non alignment.

6. The cold war: Origin, evolution and its impact on international relation: Defence and its impacts: a new Cold War.

7. Non-alignment: HEANING Bases (National and International) the non-aligned Movement and its role in international relations

8. De-colonçation and expansion of the international community; Neo-colomaism and racialism, their impact on international relations; Asian-African resurgence.

9. The present International economic order; Aid trade and economic development, the struggle for the new International Economic, Order; Sovereignty over natural resources; the crisis in energy resources.

10. The role of International Law in International relations; the international Court of Justice.

11. Origin and Development of International Organisations; The United Nations and specialçed Agencies; their role in international relations.

12. Regional Organçation: OAS, OAU, the Arab League, the ASEAN, the EEC, their role in international relations.

13. Arms race disarmament and arms control; Conventional and nuclear arms, the Arms trade, its impact on Third World role in international relations.

14. Deplomatic theory and practice.

15. External intervention: Ideological, Political and Economic; Cultural imperialism, Covert intervention by the major power.

PART-II

1. The uses and mis-uses of nuclear energy; the impact of nuclear weapons on internation relations; the partial Test-ban, Treaty; the nuclear Neo-Proliferation. Treaty (NPT) peaceful nuclear explosions (PNE).

2. The problems and prospects of the Indian Ocean being made a peace zone.

3. The Conflict situation in West Asia.

4. Conflict and co-operation in South Asia.

5. The (Post-war) foreign policies of the major powers; United States, Soviet Union, China.

6. The third world in international relations; the North-South "Dialogue" in the United Nations and outside.

7. India's foreign policy and relations; India and the Super powers; India and its neighbonr; India and South east Asia; India and African Problems; India's economic diplomacy; India and the question of nuclear weapons.

24. PSYCHOLOGY

Section-I

FOUNDATIONS OF PSYCHOLOGY

1. The Scope of Psychology- Place of Psychology in the family of social and behavioural sciences.

2. Methods of Psychology- Methodological problems of Psychology. General design of Psychological research. Types of Psychological research. The characteristics of Psychological measurement.

3. The nature, Origin and development of human behaviour- Heredity and environment. Cultural factors and behaviour. The process of socialçation. Concept of National Character.

4. Cognitive Processes- Perception, Theories of perception, Perceptual organisation. Person perception, Perceptual defence. Transactional approach to perception. Perception and personality. Figural after-effect. Perceptual styles, perceptual abnormalities Vigilance.

5. Learning- Cognitive, Operant and Classical conditioning approaches, Learning phenomena, Extinction. Discrimination and generalisation, Discrimination learning, Probability learning. Programmed learning.

6. Remembering- Theories of remembering. Short-term memory, Long-term memory, Measurement of memory, Forgetting Reminiscence.

7. Thinking- Problem solving, concept formation, Strategies of concept formation, Information processing, Creative thinking, Convergent and Divergent thinking, Development of thinking in children, theories.

8. Intelligence- Nature of intelligence Theories of intelligence, Measurement of intelligence, Measurement of creativity. Aptitude, Measurement of aptitudes. The concept of social intelligence.

9. Motivation- Characteristics of motivated behaviour. Approaches to motivation: psycho-analytic theory; Drive Theory; Need hierarchy theory, Vector valence approach, Concept of level of aspiration. Measurement of motivation. The apathetic and the alienated individual, Incentives.

10. Personality-The concept of personality. Trait and type approaches, Factorial and dimensional approaches, Theories of personality; Freud, Allport, Murray, Cattell; Social learning theories and Field Theory. The Indian approach to personality- the concept of Gunas. Measurement of personality: Questionnaires; Rating Scales; Psychometric Tests; Projective Tests; Observation method.

11. Language and Communication- Psychological basis of language. Theories of language development: skinner and Chomsky, Nonverbal communication, Body Language, Effective communication: Source and receiver characteristics. Perstasive communication.

12. Attitudes and values- Structure of attitudes, formation of attitudes. Theories of attitude, Attitude measurement. Types of attitude scales, Theories of attitude change, Values. Types of values. Motivational Properties of values. Measurement of values.

13. Recent trends.-Psychology and the Computer, Cybernetic model of behaviour. Simulation studies in psychology, Study of consciousness. Altered states if consciousness. Sleep. Dream, meditation and hypnotic trance. Drug induced changes. Sensory deprivation. Human problems in aviation and space flight.

14. Models of Man, The Mechanical Man, The Organic Man- The Organçational man. The Humanistic Man. Implications of the different models for behaviour changes. An integrated model.

Section- II

PSYCHOLOGY: ISSUES AND APPLICATIONS

1. Individual Differences.- Measurement of individual differences. Types of psychological tests. construction of psychological tests. characterstics of good Psychological tests. Limitations of psychological tests.

2. Psychological Disorders- Classification of disorders and nosological systems. Neurotic, psychotic and psychophysiologic disorders. Psychopathic personality. Theories of psychological disorder. The problems of anxiety, depression and stress.

3. Therapeutic Approaches- Psychodynamic approach. Behaviour therapy, Client centered therapy. Cognitive therapy. Group therapy.

4. Application of psychology to organçational and Industrial problems- Personnel selection. Training. Work motivation. Theories of work motivation Job designing. Leadership training. Participatory management.

5. Small Groups- The concept of small group. Properties of groups. Group at work. Theories of group behaviour. Measurement of group behaviour. Interaction process analysis. Interpersonal relations.

6. Social Change-Characteristics of social change. Psychological basis of change. Steps in the change process Resistance to change. Factors contributing to resistance. Planning for change. The concept of change -proneness.

7. Psychology and the Learning Process- The Learner. School as an agent of socialçation Problems relating to adolescents in learning situations. Gifted and retarded children and problems related to their training.

8. Disadvantaged Groups- Types: Social, cultural and economic. Psychological consequences of disadvantage. Concept of Deprivation. Educating the disadvantaged groups. Problems of motivating the disadvantaged groups.

9. Psychology and the problem of social Integration. The problem of ethnic prejudice. Nature of prejudice. Manifestations of prejudice Development of prejudice. Measurement of prejudice. Amelioration of prejudice. Prejudice and personality Steps to achieve social integration.

10. Psychology and Economic Development- The nature of achievement motivation. Motivating people for achievement. Promotion of entrepreneurship. The Entrepreneur Syndrome. Technological change and its impact on human behavior.

11. Management of Information and Communication- Psychological factors in information management. Information overload: Psychological basis of effective Communication. Mass media and their role in social change. Impact of television. Psychological basis of effective advertising.

12. Problems of Contemporary Society- Stress. Management of stress. Alcohalism and Drug addiction. The socially Deviant. Juveline Delinquency. Crime. Rehabilitation of the deviant. The problems of the Aged.

25. PUBLIC ADMINISTRATION

Section-I

ADMINISTRATIVE THEORY

I. Basic Prenises- Meaning scope and significance of Public Administration; Private and Public Administration; Role of Public Administrator in developed and developing societies: Econlogy of Administration- Social. Economic. Cultural, Political and legal; Evolution of public administration as a discipline; Public Administration as an art and a science; New Public Administration.

II. Theories of Organisation – Scientific Management (Taylor and his associates); Bureaucratic theory of organisation (Weber), Classical theory of organisations (Henri Fayol , Luther Gulick and Other); Human Relations Theory of Organisations (Elton Mayo and his Colleagues); Behavioural approach, Systems Approach; Organçational Effectiveness.

III. Principles of Organçation- Hierarchy, Unity of Command, Authority and Responsibility, Co- ordination Span of Control, Supervision, Centralçation and Decentralçation, Delegation.

IV. Administrative Behaviour- Decision making with Special Reference to the Contribution of Herbert Simon; Theories of Leadership; Communication morale; Motivation (Maslow and Herzberg).

V. Structure of Organçations- Chief Executive; Types of chief Executives and their functions; Line Staff and Auxiliary agencies; Departments; Corporation Companies. Boards and Commissions. Headquarters and field relationship.

VI. Personal Administration- Bureaucracy and Civil Services, position Classification; Recruitment: Training: Career Development; Performance Appraisal; Promotion; Pay and Service Conditions; Retirement Benefits; Discipline; Employer-Employee Relations. Integrity in Administration; Generalists versus specialists; Neutrality and Anonymity.

VII. Financial Administration- Concept of Budget; Preparation and Execution of the Budget; Performance Budgeting; Legislative Control; Accounts and Audit.

VIII. Accountability and Control- The Concepts of Accountability and Control; Legislative, Executive and Judicial Control over Administration; Citçen and Administration.

IX. Administrative Reforms- O & M; Work Study; Work Measurement Administrative Reforms; Processes and obstacles.

X. Administrative Law-Importance of Administrative Law; Delegated Legislation; Meaning. Types. Advantages, Limitations, Safeguards; Administrative Tribunals.

XI. Comparative and Development Administration- Meaning, Nature and Scope of Comparative Public Administration. Contribution of Freud. Riggs with particular reference to the prismatic sala Model. The Concept. Scope and Significance of Development Administration. Political Economic and socio-Cultural Context of Development Administration. The Concept of Administrative Development.

XII. Public Policy- Relevance of policy Making in Public Administration. The Processes of policy Formulation and Implementation.

Section-1I

INDIAN ADMINISTRATION

I. Evolution of Indian Administration- Kautilya; Mughal Period; British Period.

II. Environmental Setting- Constitution, Parliamentary Democracy, Federalism, Planning, Socialism.

III. Political Executive at the Union Level- President, Prime Minister, Council of Ministers, Cabinet Committees.

IV. Structure of Central Administration- Secretariat, Cabinet Secretariat, Ministries and Departments. Boards and Commissions, Field Organçation.

V. Centre State Relation- Legislative, Administrative, Planning and Financial.

VI. Public Services- All India Services, Central Services, State Services, Local Civil Services, Union and State Public Service Commissions. Training of Civil Services.

VII. Machinery for Planning – Plan Formulation at the National Level; National Development Council, Planning Commission; Planning Machinery at the State and District Levels.

VIII. Public Undertaking – Forms management, Control and problems.

IX. Control of Public Expenditure- Parliamentary Control; Role of the Finance Ministry; Comptroller and Auditor General.

X. Administration of Law and Order in Bihar- Role of Central and State Agencies in Maintenance of Law and Order.

XI. State Administration with special reference to Bihar- Governor, Chief Minister; Council of Ministers; Secretariat, Chief Secretary, Directorates.

XII. District Administration with special reference to Bihar– Role and Importance; District Collector; Land Revenue, Law and order and developmental functions. District Rural Development Agency; Special Development Programmes.

XIII. Local Administration with special reference to Bihar- Panchayati Raj and Urban Local Government Features, Forms, Problems, Autonomy of Local Bodies.

XIV. Welfare Administration in Bihar- Administration for the Welfare of Weaker Sections With particular Reference to Scheduled Castes and Scheduled Tribes; Programmes for the Welfare of Women and Children.

XV. Issue Areas in Indian Administration- Relationship between Political and permanent Executives. Generalists and specialists in Administration. Integrity in Administration. People's Participation in Administration. Redressal of Citçen's Grievances. Lok Pal and Lok Ayukta, Administrative Reforms in India.

26. SOCIOLOGY

Section-I

GENERAL SOCIOLOGY

1. Scientific Study of Social phenomena- Emergence of Sociology and its relationship with other disciplines, their scope and approaches. Science and Study of social behavior, the problems of objectivity, reliability and validity. Scientific methods and scientific language; their meaning, goals, types; elements and features. Research Design Techniques of data collection and analysis, Attitude measurements; problems and scales. Concept of social causation with special reference to R.M.Mac'ver.

2. Pioneering Contributions to Sociology- Theoretical beginnings- Positivism and evolutionism with reference to Comte, Spencer and Morgan; Historical Sociology contributions of Karl Mark, Maxweber and P.A. Sorokin; Functionalism; E. Durkheim, P.areto. Parsons and Merton, Conflict School; Gumplowicz Dahrenderf and Coser;

Recent approaches in Sociology, Micro Sociology, Macro Sociology, Middle Range theories, Neopostitvism, Exchange theories and Interactions Sociology.

3. Social Structure and Social Organçation; Concept and types approaches to Social Structure; Structural functionalist school, Structuralist school and Marxist School: Elements of Social Structure-Individual and society; social interaction; social groups, concept and types; concept of status and role, their determinants and types, dimensions of roles in simple and complex societies, role conflict; Social Network; Basic concepts and types, culture and personality, concepts of conformity and social control, agencies of social control; concept of Minority Groups, their relationship with majority; Secularism versus Integration.

4. Social Stratification and Mobility-Concept, consequences and types of stratification; inequality and stratification, Dimensions and bases of stratification; Theoretical approaches to the study of stratification, functionalist approach and conflict approach; Social Stratification and Social Mobility; Concept of Sankskritçation and Westernçation. Types of Mobility: intergenerational mobility, vertical versus horçontal mobility, open and closed models of mobility.

5. Family marriage and Kinship-Structure, functions and types of family marriage and kinship; social change and change in age and sex roles; change in marriage, family and kinship; significance of family in industrial society.

6. Formal organçation-Elements of formal and informal structures and organçations, bureaucracy functions, dysfunctions and characteristics, bureaucracy and political development, political socialisation and political participation, modes of participation, democratic and authoritarian forms, voluntary organçations.

7. Economic System-Property concepts, social dimensions of division of labour; type of exchange, social aspects of pre- industrial and industrial economic systems; industrialçation and changes in the political, educational religious, familiar and stratificational spheres; social determinants and consequences of economic development.

8. Political Systems-Concepts, elements and types of political systems: functions of a political system, institutions under the political system; political processes with reference to individuals, groups, political organçations, parties and other agencies. Concepts, bases and types of power, authority and legitimacy; Concept of Stateless societies; political socialçation versus political participation; properties of State. Power of elites, and masses in democracy and in totalitarian societies; political parties and voting, Leadership democratic order and democratic stability.

9. Educational Systems- Concepts and goals of education; Schools of philosophy;- Naturalism, Idealism and pragmatism, their bearing on education; importance of education in society, democracy, international understanding and nationalism. New trends in education; Role of various agencies-school home society state and religion in education and socialçation. Population Education- its concepts and components, Education as a medium of cultural reproduction, indoctrination, social stratification, mobility and modernisation.

10. Religion- The religious phenomenon; the concepts of sacred and protan, social functions and dysfunctions of religion, magic religion and science, social change and religious secularisation.

11. Social change and development- Factors of social change, economic, biological and technological; Theories of social change- evolutionary, functional and conflict; social change, modernisation and development; Democratisation equality and social justice; social reconstruction.

Section- 1I

SOCIETY OF INDIA

1. Indian Society- Features of traditional Hindu Social Organisation, Socio-cultural dynamics through the ages, impact of Buddhism, Islam and West on Indian Society, factors in continuity and change.

2. Social Stratification- Caste system and its transformation, Economic Structural and Cultural view about Caste, origin of the Caste system, issues of inequality and social justice among Hindu and Non-Hindu castes, Caste mobility, Casteism, Backward caste versus Backward Classes, Scheduled Caste and untouchability, changes among Scheduled Castes, eradication of untouchability, industrial and agrarian class structures, rising trends in inter caste relations in Bihar under the impact of Mandal Commission and its reservation policy.

3. Family, Marriage and Kinship: Regional variation in Kinship system and its socio-cultural correlates, changing aspects of Kinship, The joint family system its structural and functional aspects, its changing form and disorgançation, Marriage among various ethnic groups, economic and Caste categories, its changing trend in future, impact of legislation and socioeconomic changes upon family and marriage, inter caste marriages-causes and consequences in Bihar intergeneration gap and youth unrest, changing status of women, women and social development.

4. Economic System: Jajmani System and its bearing on the traditional society, Market economy and its social consequences, occupational diversification and social structure, professional Trade Unions, Social determinants and consequences of economic development, Economic inequalities, exploitation and corruption; causes of economic backwardness in Bihar, potentialities of economic growth in Bihar, Relationship between economic growth and social development with specific reference to Bihar.

5. Political System: Functioning of a democratic political system in a traditional society, political parties and their social composition, origin of political elites and their social orientation, decentralçation of power, political participation, voting pattern in Bihar, relevance of Caste, community and economic factor in voting behaviour in Bihar, its changing trends, Functions dysfunctions and characteristics of India Bureaucracy, Bureaucracy and political development in India, concept of mass society, Socio-political sources of mass movement in India.

6. Educational System: Education and society in the traditional and modern contexts, educational inequality and change, education and social mobility, educational problems of women, Backward Classes and the Scheduled Castes, causes of educational backwardness in Bihar, Functional and dysfunctional aspects of Mushroom growth of institutions in Bihar; Prospects and problems of higher education in Bihar, New educational Policies, Mass.

7. Religion: Demographic dimensions, geographical distribution and neighbourhood, living patterns of major religious categories; Interreligiousinter-actions and its manifestations in the problems of conversion Minority status, communications and secularism; impact of various religious Movernment in India. (Buddhism, Islam, Christianity, Brahmoism and Arya Samaj movement on caste system in India; westernçation and modernçation in Bihar; the cohesive and decisive factors, impact of growing religious and politics interrelationship of India's social organisation.

8. Tribal societies: Major tribal communities in India, their distinctive features; tribe and case their acculturation and integration; problem of Bihar tribes (social, economic and Political), different approaches to tribal welfare, constitutional and governmental safeguards; tribal movements in India. The Tanabhagat movement, the Birsa movement and the Jharkhand movement, their significance in tribal development.

9. Rural social system and community development: Sociocultural dimensions of the village community, traditional power structure, democratçation and leadership, poverty, indebtedness and bonded labour, social consequences of land reforms, community Development Programme and other planned development projects of Green Revolution, New strategies of rural development.

10. Urban Social Organçation: Continuity and change in the traditional causes of social organçation, namely Kinship, Caste and religion in the urban context, stratification and mobility in urban communities, ethnic diversity and community integration, urban neighbourhoods; rural urban differences in demographic and socio-cultural characteristics and their social consequemces.

11. Population dynamics: Theories of population growth Malthusian, biological, demographic transition, optimum population socio-cultural aspects of population composition (sex, age, martial status), determinants of fertility, mortality and migration. Need of population policy in India; population explosion and other determinants factors; social psychological cultural and ecomic determinants behind population acceptance of family planning practices in India. Family Planning Programmer through first to eighth five year plans; population education; concept, goals, aspects, agencies and techniques of population education.

12. Social Change and modernçation: Problems of role conflict youth unrest- intergenerational gap, changing status of women. Major sources of social change and of resistance to change, impact of west reform movements, social movements, industrialçation and urbançation pressure groups, factors of planned change, five year plans legislative of executive measures; process of change sanskritçation, westernçation and modernçation means of modernçation man media and education, problems of change and modernçation, structural contradictions and break-downs. Current social evils-corruption and Nepotism Smuggling, Black Money.

27. STATISTICS

Section-I

There are two sections. Candidates shall answer not more than three questions from each section.

I. Probability :

Sample space and events, probability measures and probability space, Statistical independence, Random variable as a measurable function, Discrete and continuous random variables, probability density and distribution functions, marginal and conditional distributions functions of random variables and their distributions, expectation and movements, conditional expectation, correlation co-efficient, convergence in probability in LP almost everywhere; Markov Chebyehve and Kolomogrov inequalities, Borel-Cantellilemma, weak and strong law of large numbers probability generating and characteristic functions Uniqueness and continuity theorems. Determination of distribution by moments Lindeberg. Levy central limit theorem. Standard discrete and continuous probability distributions, their interrelations including limiting cases.

II. Statistical Inference:

Properties of estimates, consistency, unbiasedness, efficiency, sufficiency and completeness Cramer Rao bond, Minimum variance unbiased estimation, Rao Block well and Lehman Sheffe's theorem methods of estimation by moment maximum likelihood, minimum Chi-square. Properties of maximum likelihood estimators confidence intervals for parameters of standards distributions.

Simple and composite hypotheses, statistical tests and critical region, two kinds of error power function unbiased tests, most powerful and uniformly most powerful tests Nyman

Person Lemma, Optimal tests for simple hypotheses concerning one Parameter monotone likelihood ratio property and its use in constructing U.M.P. test, likelihood ratio criterion and its asymptotic distributing sign test for Location. Wilcoxon- Mann- Whitney test and Kolmogor Simirnov test for the two sample problem. Distribution free confidence intervals for quantitietion, Chi-square and Kolmogor tests for goodness of fit. Run test for randomness and confidence bands for distribution functions.

Notions of a sequential test, Walds, SPRT, its CC and ASN function,

III. Linear Interence and Multivariate Analysis:

Theory of least squares and Analysis of variance. Gaussa, Markoff theory, normal equations least square estimates and their precision. Tests of signification and intervals estimates based on least square theory in one way, two way and three way classified data. Regression Analysis, linear regression, estimates and tests about correlation of regression coefficient curve linear regression and orthogonal polynomials, test for linearity and regression Multivariate normal distribution, multiple regression, multiple and partial correlation. Mahalanobis D2 and Hotelling T2- Statistics and their applications (derivations of distribution of D2 and T2 excluded) Fisher's discriminant analysis.

Section- II

I. Sampling Theory and Design of Experiments

Nature and scope of sampling, simple random sampling, sampling from finite populations with and without replacement, estimation of the standard errors sampling with equal probabilities and PPS sampling. Stratified random and systematic sampling, Two stage and multi-stage sampling, multiphase and cluster sampling schemes.

Estimation of population total and mean, use of biased and unbiased estimates auxiliary variables, double sapling standard errors of estimates cost and variance function ratio and regression estimates and their relative efficiency planning and organçation of sample surveys with special referene to recent large scale surveys conducted in India.

Principles of experimental designs, CRD, RBD, LSD, missing plot technique factorial experiemtns 2n and 3n design general theory of total and partial confounding and fractional replication. Analysis of split plot, BIB and simple lattice designs.

II. Engineering Statistics.

Concepts of quality and meaning of control, Different types of control charts like X-R charts, P charts np Charts and cumulative sum control charts.

Sampling inspection Vs. 100 per cent inspection, single, double, multiple and sequential sampling plans for attributes inspection, OC, ASN and ATI curves. Concept of producer's risk and consumer's risk AQL, AGQL, LTPD etc. Variable sampling plans.

Definition of Reliability, maintainability and availability. Life distribution failure rate and bath-tub, failure curve exponential and Weibull models, Reliabilty of series and parallel systems and other simple configurations.

Different types of redundancy like hot and cold and use of redundancy in reliability improvement problems in life testing, conscred and turncated experiments for exponential model.

III. Operational Rescrach

Scope and definition of OR difierent types of models, their construction and obtaining solution.

Homogenous discrete time Markov chains, transition probability matrix, classification of states and ergodic theorems. Homogenous continuous time Markov chains. Eleements of queuing theory, M/M/I and M/M/K queues, the problem of machine interference and GI/M/I and B/GI queues.

Concept of scientific inventory management and analytical structure of inventory problems simple models with deterministic and stochastic demand with and without leadtime. Storage models with particular reference to dam type.

The Sturcute and formation of a linear programming problem. The Simplex procedure two phase mehods and charnes- M Method with artificial variables. The quality theory of linear programming and its economic interpretation. Sensitivity analysis.

Transportation and Assignment Problems.

Replacement of items that fail and those that deteriorate, group and individual replacement policies.

Introduction to computer and elements of Fortran IV Programming Formats for input and output statements specification and logical statements and subroutines. Application to some simple statistical problems.

IV. Quantitative Economics

Concept of time-series, additive and multiplicative models, resolution into four components, determination of trend by free-hand drawing, moving averages and fitting of mathematical curves, seasonal indices and estimate of the variance of the random components.

Definition, Construcion, interpretation and limitation of index numbers, lespevre Parsche Edgewoth- Marshall and Fisher index number their comparitions tests for index numbers and construction of cost of living index.

Theory and analysis of cosumer demand – Specification and estimation of demand functions. Demand elasticities. Theory of production, Supply functions and elasticities, input demand functions. Estimation of parameters in single equation model—classical least squares, generalçed least squares heteroscedasticiyt, serial correlation, Multicollieneraity, errors in variables model, simultaneous equation models – indentification, rank and order conditions. Indirect least squares and two stage least squares, short- term economic forecasting.

V. Demogrpahy and pshychometry.

Sources of demographic data: Census registration: NSS and other demographic surveys. Limitation and uses of demographic data.

Vital rates and ratios: Definition construction and uses.

Life tables – complete and absidged: Construction of life tables from vital statistics and census returns uses of life tables.

Logistic and other population growth curves.

Measures of fertility. Gross and net reproduction rates.

Stables population theory. Uses of stable and quasi-stable population techniques in estimation of demographic parameters.

Morbidity and its measurement Standard classification by cause of death. Health surveys and use of hospital statistics.

Educational and psychological statistics methods of Standardisation of scales and tests. IQ tests. reliability of tests and T and Z scores.

28. ZOOLOGY

Section- I

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

Part- 'A'

1. A general survey, classification and relationship of the various phyla.
2. Protozoa: Study of the structure, bionomica and life history of Paramaecium, Monocyotis, Malarial Parasite, Trypanosoma and Leishmania. Locomotion, Nutrition and reproduction in Proctozoa.
3. Porifera: Canal system sheleton and reproduction.
4. Coelenterata: Structure and life history of Obelia Aurelia, Polymorphism in Hydrozoa, Coral formation, Metagenesis, Phylogenetic relationship of Cinideria and Acnidaria.
5. Helminths: Structure and life history of Planaria, Fasciola, Taenia and Ascaris. Parastic Adaptation, Helminths in relation to man.
6. Annelida: Nereis, Earthworm and Leech, Coelom and Metamerism, Modes of life in Polychaectes.
7. Arthropoda: Paleomon, Scropion, Cockroach. Larval forms and Parasitism in Crustacea, Mouth part vision and respiration in arthropods, Social life and Metamorphosis in insects. Importance of Paripatus.
8. Mollusca: Unio Pila, Oyster Culture and Pearl formation, Cephalopods.
9. Echinodermata: General organçation, Larval, forms and affinities of Echinodermata.
10. General organçation and characters, Outline classification and interrelationship of Protochordata, Pisces, Amphibia, Reptilia, Aves and Mammalia.
11. Neoteny and retrogressive Metamorphosis.
12. A general Study of comparative account of the various systems of Verterbrates.
13. Locomotion, Migration and respiration in fishes, Structure and affinities of Dipnoi.
14. Origin of Amphibia, distribution, Anatomical Peculiarities and affinities of Urodela and Apoda.
15. Origin of Reptiles, Adaptive Radiation in Reptiles, fossil Reptiles, Poisonous and non-Poisonous Snakes of India, Poison Apparatus of Snake.
16. Origin of Birds, Flightless Birds, Aerial adaptation and migration of Birds.
17. Origin of Mammals, Nomologies of ear ossicles in Mammals, Dentition and Skin derivatives and Manmmals, Distribution, Structural Peculiarities and Phylogenetic relation of Prototheria and Methatheria.

Part- 'B'

Ecology, Ethology, Biostatics and economic Zoology:-

Ecology:-

1. Environment: Abiotic factors and their role, Biotic factors – and Inter – specific relations.
2. Animal: Organisation at population and community levels, ecological successions.
3. Ecosystem: Concept, Components, Fundamental operation, Energy flow, Biogeo-chemical cycle, food chain and Trophic levels.
4. Adaptation in fresh water, Marine and Terrestial habitats.
5. Pollution in air, Water and Land.
6. Wild life in India and its conservation.

Ethology –

7. General survey of various types of animal behaviour.
8. Role of hormones and pheromones in behavioures
9. Chronobiology: Biological check, Seasonal Rhythms, Tidal Rhythms.
10. Neuro-endocrine control of behaviour.
11. Methods of studying animals behaviour.

Biostatistics-

12. Methods of sampling, Frequency distribution and measures of central tendency, Standard deviation, Standard error and Standard deviance, Correlation and Repression and Chi-square and f-test.

Economic Zoology –

13. Parasitism, Commensalism and host Parasite relationship.
14. Parasitic Protozoans, Helminthes and insects of man and domestic animals.
15. Insect pests of crops and stored products.
16. Beneficial insects.

17. Pisciculture and induced breeding.

Section- II

Cell Biology, Genetics, Evolution and Systematics, Bio-chemistry, Physiology and Embryology.

Part- I

Cell Biology, Genetics, Evolution and Systematics.

1. Cell Biology- Structure and function of Cell and Cytoplasmic Constituents, Strtucture of Nucleus, Plasma Membrane Mitochondira, Golgibodies, Endo, plasmic Reticulum and Ribosomes, Cell Division, Mitosis Spindle and Chromosome movements and Meiosis.

Gene structure and function, Watson-Crick model of DNA, replication of DNA Genetic code, Protein Synthesis, Cell differentiation, Sex-chromosomes and Sex determination.

2. Genetics – Mendelian laws of inheritance, recombinations, Linkage and Linkage Maps, Multiple, Allels, Mutation (Natural and Induced), Mutation and Evolution Meiosis, Chromosome number and form, Structural rearrangements, Polyploidy, Cytoplasmic inheritance, Regulation of Gene expression in Prokaryotes and Eukaryotes. Bio-chemical Genetics, Elements of human Genetics, Normal and Abnormal Karyotypes, Genes and Diseases. Eugenics.

3. Evolution and Systematics, – Origin of life, history of evolutionary thought, Lamarck and his works. Darwin and his works, sources and nature of organic variation, Natural selection, Hardy-weinberg law, Cryptic and warning colouration mimicry, Isolating mechanisms and their role. Insular faunaconcept of species and sup-species, Principles of classification, Zoological nomenclature and International Code. fossils, outline of geological cras phylogeny of Horse, Elephant, Camel, Origin and evolution of man, Principles and theories of continental distribution of animals, Zoogeographical realms of the world.

Part- II

Bio-chemistry, Physiology and Embryology.

Bio-chemistry: Structure of Carbohydrates, Lipids, Amino-acids, Proteins, and Nucleic Acid, Glycolysis and Krebs Cycle, Oxidation and reduction, Oxidative Phosphorylation, Energy conservation and release ATP, Cyclic AMP, Saturated and unsaturated fatty acids, Cholesterol, Steroid hormones, Type of eæymes, Mechanism of eæyme action, Immunogolobulins and Immunity, Vitamins and coeæymes, Hormones their classification, Biosynthesis and functions.

2. **Physiology** with special reference to Mammals, Composition of blood, Blood groups in man, coagulation, Oxygen and carbondioxide Transport, Haemoglobin. Breathing and its regulation, Nephron and Urine formation, Acid-Base balance and homeostasis, temperature regulation in man, mechanism of conduction along axon across Synapes, Neurotransmitters, Vision, Hearing and other receptors, Types of Muscles, Ultrastructure, and mechanism of contraction of Skelteal Muscle, Role of Salivary Gland, Liver Pancreas and intestinal glands in digestion Absorption of digested food, Nutrition and balanced diet of man, Mechanism of action of Steriod and Peptide Hormones, Role of hypo-thalamus, Pituitary Thyroid, Parathyroid, Pancreas, Adrenal, Testis, Ovary and Pineal organs and their inter-relationships, Physiology of reproduction in humans, Hormonal control of development in man and insects, Pheromones in insects and Mammals.

3. **Embryology: -** Gametogenesis, Fertilçation, Types of Eggs, Cleavage, development upto gastrulation in Branchiostoma, Frog and Chick, Fate maps of Frog and Chick. Metamorphosis in Frog, Formation and Fate of Extra Embryonic menbranes in Chick Formation of Amnion. Allantois and types of placenta in Mammals, Function of Placenta in Mammals, Organisers, Regeneration, Genetic control of development. Organogenesis of central nervous system, sense organs heart and Kidney of vertebrate embryos. Aging and its implication in relation to man.

29. HINDI LANGUAGE AND LITERATURE

Section-I

1. History of Hindi Language.
(i) Grametical and Lexical features of Apabhransa, Avahatta and early Hindi.
(ii) Evolution of Avadhi and Braj Bhasa as literary Language during the Medieval period.
(iii) Evolution of Khari Boli-Hindi as literary Language during the 19th Century.
(iv) Standardçation of Hindi Language with Devanagri Script.
(v) Development of Hindi as Rashtra Bhasa during the Freedom Struggle.
(vi) Development of Hindi as official language of Indian Union Since Independence.
(vii) Major Dialects of Hindi and their inter-relationship.
(viii) Significant grammetical features of standard Hindi.
2. History of Hindi Literature.
(i) Chief characteristics of the major periods of Hindi Literature: vç., Adi Kal, Bhakti Kal, Riti Kal, Bhartendu Kal and Dwivedi Kal, etc.
(ii) Significant features of the main literary trends and tendencies in Modern Hindi: vç, Chhayavad Rahasyavad, Pragativad, Proyogvad, NayiKavita, Nayi Kahani, Akavita, etc.
(iii) Rise of Novel and Realism in Modern Hindi.
(iv) A brief history of theatre and drama in Hindi.
(v) Theories of literary criticism in Hindi and Major Hindi Literary critics.
(vi) Origin and development of literary genres in Hindi.

Section- II

This paper will require first – hand reading of the text prescribed and will be designed to test the candidate's critical ability.

KABIR- KABIR GRANTHAVALI by Shyam Sunder Das (700 Staæas from the beginning).

SURDAS – BHRAMARA GEET SAAR 200 Staæas from the beginning.

TULSIDAS – RAMCHARITMANAS (Ayodhyokand only): KAVITAVALI (Uttarakand only)

BHARATENDU HARISHCHANDRA – ANDHER NAGARI.

PREMCHAND – GODAN . MANSAROVAR (BHAG EK)

JAYASHANKAR "PRASAD"- CHANDRAGUPTA, KAMAYANI (Chinta, Shradha, Lajja, Ida only).

RAMA CHANDRA SHUKLA – CHINTAMANI (PAHILA BHAG) (10 Essay from the beginning).

SURYA KANT TRIPATHI NIRALA – ANAMIKAHAI (Saroj Smriti). (Ramki Shakti Pooja only).

S.H. VATSYAYAN– ACUEYA – SHEKHAR EK JEEVANI (TWO PARTS).

GAJANAN MADHAV MUKTIBODH – CHAND KA MUKHTEDHA HAI (Andhere mein only).

30. ENGLISH LANGUAGE & LITERATURE

Section- I

Detailed study of a literary age (19 th century).

The paper will cover the study of English literature from 1798 to 1900 with special reference to the works of Wordsworth. Coleridge, Shelley, Keats, Lamb, Hazlitr. Thackeray, Dickens, Tennyson, Robert Browning Arnold, George Eliot, Caryle Ruskin, Peter.

Evidence of first – hand reading will be required. The paper will be designed to test not only the candidate's knowledge of the authors prescribed but also their understanding of the main literary trends during the period. Questions having a bearing on the social and cultural background of the period may be included.

Section- II

This Paper will require first- hand reading of the texts prescribed and will be designed to test candidate's critical ability.

1. Shakespeare – As you like it; Henry IV Part I. II- The Hamlet, The Tempest.
2. Milton – Paradise Lost.
3. Jane Austen – Emma
4. Wordsworth – The Prelude.
5. Dickens – David Copperfield.
6. George Eliot – Midddlemarch.
7. Hardy – Jude the Obscure
8. Yeats – Easter 1916.

The Second Coming – Byzantium.
A Prayer for My Daughter – Leada and the Swan.

Sailing to Byzantium – Meru.
The Tower: Among School Children – Lapois Lazudili.
9. Eliot- The Waste Land.
10. D.H. Lawrence – The Rainbow.

31. URDU LANGUAGE & LITERATURE

Section- I

(a) The coming of the Aryans in India – The development of the Indo Aryan through three stages. Old Indo-Aryan (OIA). Middle Indo Aryan (MIA) and New Indo-Aryan (NIA) – Grouping of the new Indo Aryan Languages – western Hindi and its dialects Khari Boli, Braj Bhasha and Haryanwi– Relationship of Urdu to Khadi- Perso-Arbic elements in Urdu Development of Urdu from 1200 to 1800 in the North and 1400 to 1700 in the Deccan. With special reference to the Development of Urdu in Bihar from 1200 to 1800.
(b) Significant features of Urdu Phonology- Morphology Syntax – Perso-Arabic elements in its Phonology, Morphology and Syntax its vocabulary.
(c) Dakhani Urdu- Its origin and developments, its significant linguistic features.
(d) The significant features of the Dakhani Urdu literature (1450-1700)- The two classical backgrounds of Urdu Literature –Perso-Arabic and Indian – Mysnavi, Indian Tales – the influence of the the west on Urdu literaclassical genres – Ghazal, Masticism – Qasida, Rubai-Qita, Prose, Fiction, Modern Genres Blank Verse, Free Verse, Novel. Short Stories, Drama-Literary criticism and Essay.

Section- II

The paper will require first-hand reading of the texts prescribed and will be designed to test the candidate's critical ability.

PROSE

1. Mir Amman – Bagh-O Bahar.
2. Ghalib- Khatu-e-Ghalib (Anjuman Tarraque-e-Urdu).
3. Kalimuddin Ahmad – Urdu Tanqueed Per Aik Nazar.
4. Ruswa – Uma O Jan Ada.
5. Prem Chand – Wardat.
6. Abdual Kalam Azad – Ghubar-e-Khatir.
7. Imtiaz Ali Taj – Anar Kali

POETRY

8. Mir – Intikhab-e-Kalam-G-Mir,Ed. Abdul Haq
9. Sauda- Qasaid (including Hajwiyat)
10. Ghalib – Diwan-e-Ghalib.
11. Iqbal – Bal-a-Gibrail
12. Josh Malihabadi – Saif Subu
13. Shad Azimabadi – Kulliyat –e- Shad.
14. Faiz – Kalam-e-Faiz (Complete)

32. BENGALI LANGUAGE & LITERATURE

Section- I

1. History of the Bengali Language.
(i) Origin and development of the language.
(ii) Major dialects of Bengali.
(iii) Sadhu Bhasa and Chalita Bhasa.
(iv) Problems of Standardçation and reform with special reference to spelling system alphabet and transliteration (Romançation).
2. History of Bengali Literature.
Students are expected to be acquainted with :
(i) The history of the Bengali Literature from the earliest period to the modern times.
(ii) Social and cultural background of Bengali Literature.

(iii) Sanskritic background of Bengali Literature.
(iv) Western influence on Bengali Literature.
(v) Modern trends.

Section- II

This paper will require first – hand reading of the text prescribed and will be designed to test the candidate's critical ability.

1. Vaisnava Padavali.
2. Mukundaram – Chandimangal.
3. Michael Madhusudan Datta – Meghanadvadh Kavya.
4. Bankim Chandra Chattopadhyay – Krishna Kanter Vill, Kamala Kanter Deptar.
5. Rabindranath Tagore – Galpagucha (1) Chitra, Punscha Rakta Karabi
6. Sarat Chandra Chattopadhyay – Srikanta (1)
7. Pramatha Chaudhuri – Prabandha Sangraha (1)
8. Bibhuti Bhushan Bandhopadhyay – Pather Panchali.
9. Tarashankar Bandhopadhyay – Ganadevata.
10. Jibananada Das – Banalata Sen.

33. SANSKRIT LANGUAGE & LITERATURE

Section- I

There will be four parts.

Part- 1. (a) Origin and development of language (from Indo-European to middle Indo-Aryan languages) (General outline only).
(b) Significant features of the grammar with particular stress on Sandhi Karaka, Samasa and Vachya (Voice).
Part- 2. General Knowledge of literary history and Principal trends of literary criticism. Origin and development of literary, genres, including epic, drama, prose, kavaya, Lyric and Anthology.
Part- 3. Essentials of Ancient Indian Culture and Phiosophy with special stress on –
Varnashrama Vyavastha, Sanskaras and Principal Phiolosophical trends.
Part- 4. Short essay in Sanskrit.

NOTE – Questions of parts (3) and (4) are to be answered in Sanskrit.

Section- II

There will be two parts.
Part- 1. General study of the following works:-
(a) Kathopanisad.
(b) Bhagavadgita.
(c) Buddhachar gita – (Asvaghosha)
(d) Swapnavasavadatta – (Bhasa)
(e) Abhigyansakuntala (Kalidasa)
(f) Meghaduta – (Kalidasa)
(g) Raghuvansa – (Kalidasa)
(h) Kumarashambhava – (Kalidasa)
(i) Mricchakatika– (Sudraka)
(j) Kiratarjuniyam – (Bharavi)
(k) Sisupalavadha – (Magha)
(l) Uttararamacharita – (Bhavabhuti)
(m) Mudraraksasa – (Visakhadatta)
(n) Naisadhacharitra (Sriharsa)
(o) Rajatarangini (Kalhana)
(p) Nitaisataka (Bharatihari)
(q) Kadambari – (Banabhatta)
(r) Harsacharita – (Banabhatta)
(s) Dasakumaracharit-(Dandi)
(t) Probadhachandrodaya-(Krishna Mishra)

Part- 2. Evidence of first hand reading of the following selected texts: -

Texts for reading (textual questions will be asked from these portions only)

1. Kathopanishad I Chapter III Valli Verses 10 to 15
2. Bhagwatgita II Chapter (13 to 25 verses)
3. Budhacharita Canto III (1 to 10 verses)
4. Svapna Vasavadatta (6th Act.)
5. Abhijnaha Shakuntalam (4th Act)
6. Meghaduta (1 to 10 opening verses)
7. Kiratarjuniyam (1st canto)
8. Uttara Ramacharitam (3rd Act)
9. Nitishataka (1 to 10 verses)
10. Kadambari (Shukanasopadesha)
11. Kautilya Arthasastra-I Adhikarana I Prakarana – 2nd Adhyaya entitled; Vidyasamuddesah. tatra anviksikishthapana. and VII Prakarans 11th Adhayaya entiteled: Gudhapurusotpottih. Prescribed editions R.P. Kangle, The Kautilya Arthasastra, Part I. A critical edition, Motilal Banarasi dass, Delhi 1986.

Note- To Part No. 2- Questions carrying minimum of 25% marks should be answered in Sanskrit.

34. PERSIAN LANGUAGE AND LITERATURE

Section- I

1. (a) Origin and development of the language (in outline)
(b) Significant features of the grammer of the language Rhetories Prosody.

2. Literary History and Literary criticism-Literary movements, classical background, Socio-Culture influences and Modern trends Origin and development of Modern Literary genres including Drama, Novel, Short Story, Essay.

3. Short Essay in Persian.

Section- II

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

1. Firdausi.

Shah Nama:

(i) Dastan Rustam Wa Suhrab.
(ii) Dastan Vizanba Mança.

2. Nizaemi Aruzi Samarquadi

Chahar Magalas.

3. Khayyam, Rubaiyat, (Radif Alif, Be, Dal)
4. Minucheheri-Qasaid (Radif Lam and Mim)
5. Maulana Rum Masunawi (1st Vol. 1st Half)
6. Sadi Shirazi

Gulistan.

7. Amir Khusrau.

Majmua-i-Dawawin Khusrau (Radif Alif and Te)

8. Hafiz

Diwan –i – Hafiz (1st half)

9. Abul Fazi

Ain-i- Akbari.

10. Bahar Mashhadi. Diwan-i-Bahar (1st Vol., 1st half)
11. Jawal Zadesh. Yake Bud Yake Na Bud.

Note – Candidates will be required to answer in Persian questions carrying not less than 25 per cent marks.

35. ARABIC LANGUAGE AND LITERATURE

Section- I

1. (a) Origin and development of the language in outline.
   (b) Significant features of the grammer of the Language, Rhetories, Prosody.
2. Literary History and Literary criticism – Literary movements, classical background, Socio-Cultural influences, and modern trends, Origin and development of modern Literary generes including Drama, Novel, Short Story, Essay.
3. Short Essay in Arabic.

Section- II

This paper will require first-hand reading of the texts prescribed and will be designed to test the candidate's critical ability.

POETS:_

1. Imraul Qais: His Maullagah:-

"Qifaa Nabki mim Zikaa Hawibin Wa Manzili" (Complete).

2. Zoflair Bin Abi Sulma: His Maullahqa: -

"A min Aufaa Dimnatun Lam Takalemi" (Complete)

3. Hassan Bin Thabit: The following five Qasaid from his Diwan:: from Qasidah no. 1 to Qasidah IV and the Qasidah:-

"Lillahi, Darni Isaabatin Nadamthuhm + Yauman BiJililage"

4. Umar Bin Abi Rabiah: 5 Ghazals from his Diwan:-

(i) Falamma Towagafna Wa Sallamtu oshraqat Wujudhum Zahahal Husnu An-Tata guanna (Complete).
(ii) Laita Hindan Anjazanta Ma Taidu+Wa Shaft Anfusona Mimma Tajidu (Complete).
(iii) Katabtu IIaiki Min Baladi + Kitaba Muwallahim Kamdi (Complete).
(iv) Amin AAli Numin Anta Ghaadin Famubkiru Ghadia Ghandia An Raaihum Famuhajjaru (Complete).
(v) Qaalali Feeha Ateequn Maqaalan. + Fajarat Mimma Yaqoolud dumoou (Complete).

5. Faradaq: The following 4 Qasaid from his Diwan:

(i) "Haazal Iazi Tarriful Bathaau Watatahu" in praise of Zainul Abideen Ali Bin Hussain.
(ii) "Zarrat Sakeenatu Atleahan Ankha Bihim" in praise of Umar Bin A. Azç.
(iii) "Wa Kcomin Tanamul Adhyaf Ainan" in praise of Saeed Bin Al-ass (Complete)
(iv) "Wa Atlasa Assaalin Wa maakano Sahiban" in praise of "the Wolf".

6. Bashhar Bin Murd. The following two Qasaid from his Diwan:

(i) "Izaa Balaghar Raaiul Mashwarata Fastain + Biraai Naseehinaw Naseefate Haazimi" (Complete).

Khaillaiya Min Kabin Aeenaa Akhookumma Allaa Darahi Innal Kareem Muinu (Complete).

7. Aba Nawas: First three Qasaid from the Diwan.
8. Shauoh. The following five Qasaid from his Diwan "Al-Shauquiyal".
   (i) "Ghaaba Boloum" (Complete).
   (ii) "Kaneesatusm Saarat Illa Masjidi" (Complete).
   (iii) "Ashloo Hawaki Ilman Yaloomu Fayaozafu" (Complete).
   (iv) "Salaamun Min Saban Baradaa Araqqu (Nakbatu Dimashk)" (Complete).
   (v) Salaamun Neel Yaa Ghandi – Wa Hazaz Zahru Min Indi" (Complete).

AUTHORS:-

1. Ibnul Muqaff: "Kaliala Wa Dimna" excluding Muqaddamah: Chapter I. Complete "Al-Asad Wa-al Thaus".
2. Al-Jahis: Al-Bayan Wat Tab: in VII edited by Abdul Salam Mohd. Haroon, Cairo, Egypt from pp. 31 to 85.
3. Ibn Khaldun: his Muqaddamah: 39 Pages, Part Six from the first Chapter:
   From "Al Faslul Saadis Minal Kitaabil Awal" to "Wa Min Furoodhi at Jabruwal Muqabla".
4. Mahmud Timur: Story, "Amni Mutawallji" from his book "Qaalar Raavi".
5. Taufiq Al-Hakim: Drama: "Sinnul Muntahiraa" from his book "Masrahiyatu Tahiqal Hakim".

NOTE:-

Candidates will be required to answer some questions carrying not less than 25 per cent marks in Arabic also.

36. PALI LANGUAGE & LITERATURE

Section- I.

There will be four parts in this section.

Part 1. (a) Origin and development of the language (a general outline only, from the Indo-European to the Middle Indo-Aryan Languages), its homeland and the main characteristies.
(b) Salient features of the grammar with particular emphasis on Sandhi, Karaka, vibhakti, Samasa, Itthipaccaya, Apacca (Bodhpacoaya) and Sankhaya (bodhaka paccaya).

Part 2. General Knowledge of the history of the literature (pitaka literature and post-pitaka literature). Principal forms of writings including analytical compositions (Meitipakarana, Petakopedesa, Milinadapanda). Chronicles (Dipavenss, Mahavansa etc.) Commentatorial expositions (Atthakathas of Buddhas, Buddhaghosa and Dhammapla), origin and development and literary genres including epic prose, Kavya, Lyric and Anthology.

Part 3. Essentials of pre-Buddhistic and post-Buddhistic India Culture and Philosphy with special reference to the four Noble-Truths. (Cattari Ariyasaccant). Tilakkhana (Dukkha Anatta and Anicca) and four Abhidhammic paramaitth as (Cita, Cetasika, Pupa and Nibbana)
Part 4. Short essay in pali (based on Budhistic themes only)
[Questions on section (3) and (4) to be answered in pali].

Section- II

There will be two parts in this section.

Part 1. General study of the following works: -
(a) Mahavagga.
(b) Cullavaga.
(c) Patimokkha.
(d) Dighamkaya.
(e) Mjihimanikaya.
(f) Samyuttanikaya.
(g) Dhammapada.
(h) Suttanipata.
(i) Jataka.
(j) Chergatha
(k) Theragatha
(l) Dhammasangani.
(m) Kathavatthu.
(n) Millindapanha.
(o) Dipavansa.
(p) Mahavansa
(q) Atthasalini.
(r) Visudhimagga.
(s) Abhidhammatthasangaho.
(t) Teleckatahagatha
(u) Subodhalankara.
(v) Vouttodaya.

Part 2. Evidence of the first-hand reading of the following selected texts (Textual questions will be asked from the portions mentioned against each texts).
(i) Mahavagga (Mahakhandhaka only).
(ii) Dighanikaya (Samannaphala-sutta only).
(iii) Majihimanikaya (Mulapariyaya – Setta and Samma ditthisutta).
(iv) Dhammapada (Yamaka, Vagga only).
(v) Suttanipata (Uraga Vagga only).
(vi) Milindapanha (Lakkhanapannho only).
(vii) Mahavansa (Pratham –Sangiti, Dutiya-Sangiti and Tativa- Sangiti).
(viii) Visuldhimagga (Sila niddesa only)
(ix) Abhdhammatthasangaho.

Note to Item No. 2 (1) Questions carrying minimum 25 percent marks should be answered in pali (2) Passages for translation and annotation will be selected only from the portions given above within parenthesis.

37. MAITHILI LANGUAGE AND LITERATURE

Section- I

Part- I

A. Origin of Maithili Language.

B. Position of Maithili in Indo-Europeans Family of Languages.

C. Historical Development of Maithili Language.

D. Relationship of Maithili with Hindi, Bengali, Bhojpuri, Magahi and Santhali.

E. Different Dialects of Maithili Languages.

F. Characteristics of Standard Maithili.

Part-II

A. Determination of ages in Maithili Literature and their chief characteristics/features.

B. Development of Modern Maithili Poetry.

C. Development of Modern Maithili Novels.

D. Development of Modern Maithili Drama.

E. Development of Modern Maithili Short Story.

F. Development of Modern Maithili Essays and Criticism.

Section- II

This paper will require first hand reading of the prescribed Text and will be designed to test the candidates critical ability. Vidyapati-Vidyapati Geetawall, Maithili Academy, Patna, Poem No.- 1 to 50

Govinddas- Govinddash Bhajanawali, Maithili Academy, Patna. Poem No.- 1 to 50

Manboth- Krishnajanma

Chanda Jha- Mithila Bhasha Ramayan (Sunderkant Only)

Yatri- Chitra

Munshi Reghunandan Das- Mithila Natak

Aysi Prasad Singh- Suryamukhi

Prof. Hari Mohan Jh- Kanyadan and Dwiragaman

Prof. Ramanath Jha- Prabandh Sangrah

Raj Kamal Choudhary- Lalka Paag.