PUBLIC SERVICE COMMISSION, WEST BENGAL

WEST BENGAL CIVIL SERVICE (EXECUTIVE) ETC. EXAMINATION, 2011

SCHEME AND SYLLABUS

The scheme and syllabus of the examination shall be as detailed in the Schedule below :-

1. **Scheme of the Preliminary Examination :** The Preliminary Examination will consist of only one paper, viz., a paper on "General Studies". The paper will be of an objective type consisting of 200 multiple-choice questions. The paper will carry 200 marks and will be of 2½ hours duration. The standard of the paper will be of the level of knowledge as expected of a graduate of any faculty of a recognized University. The paper will include questions covering the following fields of knowledge:

(i)	English Composition	25 Marks
(ii)	General Science	25 Marks
(iii)	Current events of National & International Importance	25 Marks
(iv)	History of India	25 Marks
(v)	Geography of India with special reference to West Bengal	25 Marks
(vi)	Indian Polity and Economy	25 Marks
(vii)	Indian National Movement	25 Marks
(viii)	General Mental Ability	25 Marks

An outline of the syllabi is given in Appendix – I

The Preliminary Examination is meant to serve as a Screening Test only for the purpose of selection of candidates for the Main Examination. The marks obtained in this examination by the candidates will not be considered for final selection. Only those candidates who will be declared qualified at the Preliminary Examination in a year will be eligible for admission to the W.B.C.S. (Exe.) etc.(Main) Examination of that year.

2. **Scheme of the Main Examination :** The Main Examination will consist of five Compulsory papers and two optional subjects (one optional subject for candidates applying only for group C and / or D) to be chosen by the candidates from the list of optional subjects given below. If a candidate offers two optional subjects and intends to compete for only Group – 'C' and/or 'D', he/she will be allowed the Optional Subject mentioned first. There will be two papers on each optional subject. Every paper – Compulsory or Optional – will carry 100 marks and will be of 3 hours' duration.

Compulsory Papers :

Paper I **:** Bengali/Hindi/Urdu/Nepali Essay, Précis Writing, Composition and Translation from English into Bengali/Hindi/Urdu/Nepali (Marks 40+20+20+20).

Paper II **:** English Essay, Précis Writing, Composition and Translation from Bengali/Hindi/ Urdu/Nepali into English (Marks 40+20+20+20).

Paper III **:** General Knowledge and Current Affairs (Excluding questions on the Constitution of India and the Five-year Plans (Marks 50+50).

Paper IV **:** The Constitution of India and the Five-year Plans (Marks 50+50).

Paper V **:** Arithmetic and Test of Reasoning (Marks 50+50).

3. **List of Optional Subjects :** (Vide restriction on choice in Item No.-4 below and syllabi in Appendix-I)

Subject	Code
Bengali	01
Hindi	02
Sanskrit	03
English	04
Pali	05
Arabic	06
Persian	07
French	08
Urdu	09
Comparative Literature	10

Subject	Code
Agriculture	11
Animal Husbandry and Veterinary Science	12
Anthropology	13
Botany	14
Chemistry	15
Civil Engineering	16
Commerce and Accountancy	17
Computer Science	18
Economics	19
Electrical Engineering	20
Geography	21
Geology	22
History	23
Law	24
Mathematics	25
Management	26
Mechanical Engineering	27
Medical Science	28
Philosophy	29
Physiology	30
Physics	31
Political Science	32
Psychology	33
Sociology	34
Statistics	35
Zoology	36

4. **Restriction on choice of Optional Subjects :** Candidates will be allowed to offer optional subjects mentioned below in the following restricted manner.

i) Bengali/Hindi/Sanskrit/English/Pali/Arabic/Persian/French/Urdu/Comparative Literature (candidates will have the option to choose if they so intend, only one of those subjects as an optional paper).

ii) Commerce and Accountancy or Management

iii) Sociology or Political Science or Anthropology

iv) Mathematics or Statistics

v) Agriculture or Botany

vi) Animal Husbandry and Veterinary Science or Medical Science or Physiology or Zoology

vii) Civil Engineering or Electrical Engineering or Mechanical Engineering or Computer Science

viii) Geography or Geology

ix) Philosophy or Psychology

5. The standard of Arithmetic part of Compulsory Paper – V – Arithmetic & Test of Reasoning will be similar to that of the Compulsory Mathematics paper at the Madhyamik Examination of the Board of Secondary Education, West Bengal. Test of Reasoning will cover Analytical Reasoning – Data Sufficiency; Logical Reasoning – (1) Logical Deduction, (2) Forcefulness of the Arguments, (3) Implication of sentences, (4) Inferring from diagrams; Series – (1) Letter series, (2) Number series; Inferring from Data; analogy tests; Symbol Interpretation; Mathematical puzzles; Odd man out; Perception test; Non-verbal reasoning; Selecting the correct sequence.

The standard of other compulsory papers will be of the level of learning expected of a graduate of any faculty of a recognized University.

The standard of the examination in optional subjects will be approximately that of an Honours Degree Examination as prescribed by the recognized Indian Universities except Law, Medical Science and Engineering subjects. For Law, Medical Science and Engineering subjects those specified for the LLB course theoretical papers for MBBS and BE or equivalent courses respectively of recognized Indian University / Institution.

6. Answers in all the paper – Compulsory and Optional – except the language papers may be written either in English or in Bengali (unless otherwise directed in these rules or in the question papers). Answers in the following compulsory and optional papers may also be written in Nepali :

Compulsory **:** (1) General Knowledge & Current Affairs.
(2) The Constitution of India & the Five-Year Plans.

Optional **:** (1) Political Science
(2) Botany

Note : Candidates should write their answers to all the questions in only one and the same language in any particular paper.

Candidates may use the Devanagari or Bengali Script in the answer papers on Sanskrit; the Devanagari Script in the answer papers on Hindi or Nepali; and the Bengali, Arabic, Persian and Urdu Scripts respectively in the answer papers on Bengali, Arabic, Persian & Urdu.

7. **A summary of the group-wise papers in the Main Examination :** Group 'A' & 'B' Services & Posts : All 5 compulsory papers and two optional subjects of two papers each.

Group 'C' & 'D' Services & Posts : All 5 compulsory papers and one optional subject of two papers.

In case of a candidate competing for Group 'A' and / or 'B' along with Group 'C' and / or 'D' and offering two optional subjects the particular optional subject in which higher marks have been secured will be taken into account in calculating his / her aggregate in Group 'C' and / or 'D'.

8. **Personality Test :** A number of candidates selected in order of merit on the results of the Main Examination (Written) for all the services and posts included in Groups A. B, C and D will have to appear for the Personality Test. Each candidate will be asked questions on matters of general interest. The object of the test will be to assess the candidate's personal qualities, e.g., alertness of mind, power of clear and logical exposition, intellectual and moral integrity, leadership and also the candidates' range of interests.

Candidates for Group 'B' Service (West Bengal Police Service) will be specially tested at the interviews with regard to their suitability for the service.

Marks for the Personality Test

(i) Group 'A', 'B' & 'C' 200 Marks

(ii) Group 'D' 100 Marks

9. **Deduction of marks :** In all the answer papers under examination due credit will be given for proper economy of words combined with clarity, precision and effectiveness of expression and originality of approach.

A deduction of 10% of full marks may be made from the total marks secured by a candidate in a particular paper if he / she discloses his / her identity by writing his / her name, roll number or by putting any identifying marks inside the answer script of that paper.

10. **Discretion of the Commission :** The Commission has discretion to fix qualifying marks in any or all the papers / subjects and in the aggregate.

If a candidate fails to secure qualifying marks in any paper / subject, the marks in that paper / subject will not be considered in calculating his / her aggregate.

Abstract Table of Papers / Subjects and Marks

Main Examination and Personality Test

Sl. No.	Compulsory Papers	Group A	Group B	Group C	Group D
1.	Bengali / Hindi / Urdu / Nepali Essay, Précis Writing, Composition and Translation from English into Bengali / Hindi / Urdu / Nepali	100	100	100	100
2.	English Essay, Précis Writing, Composition and Translation from Bengali / Hindi / Urdu / Nepali into English	100	100	100	100
3.	General Knowledge and Current Affairs	100	100	100	100
4.	The Constitution of India and the Five-year-Plans	100	100	100	100
5.	Arithmetic and Test of Reasoning	100	100	100	100
6.	Optional Subjects :	400	400	200	200
7.	Personality Test :	200	200	200	100
	Total Marks :	**1100**	**1100**	**900**	**800**

APPENDIX – I

SYLLABI FOR PRELIMINARY EXAMINATION

Questions on English Composition will cover Synonyms, Antonyms, Idioms and Phrases, Vocabulary test, Phrasal Verbs, the same words bearing more than one meaning, use of appropriate and qualifying words etc. Questions on General Science will cover general appreciation and understanding of science, including matters of everyday observation and experience as may be expected of a well-educated person who has not made a special study of any scientific discipline. In History, emphasis will be on broad general understanding of the subject in its social, economic and political aspects. Questions on the Geography of India will relate to Physical, Social and Economic Geography of the country, including the main features of Indian Agricultural and Natural Resources with special reference to West Bengal. Questions of Indian Polity and Economy will test the knowledge of the country's Political System, Panchayatee Raj, Community Development and Planning in India, Questions on the Indian National Movement will relate to the nature and character of the Nineteenth Century Resurgence, Growth of Nationalism and Attainment of Independence. General Mental Ability will relate to Logical perception, understanding and natural conclusion.

SYLLABI FOR OPTIONAL PAPERS OF MAIN EXAMINATION

1.(i)	**ENGLISH :**	
	Paper – I :	History of English Literature; History of English Language, Shakespearean Drama.
	Paper – II :	English Poetry from 1798 to 1922 : Prose Drama of late Nineteenth and early Twentieth Centuries; Prose Fiction of the Nineteenth Century; Practical criticism, Comment and Appreciation.
(ii)	**SANSKRIT :**	
	Paper – I :	(a) Sanskrit linguistics; (b) Sanskrit grammar; (c) Translation from Vedic Texts into English; translation from Classical Sanskrit into English; translation from English into Sanskrit.
	Paper – II :	(a) History of Vedic and Classical Sanskrit Literature; (b) Texts (meant for general acquaintance and not for minute study) : (1) Kalidas's Abhignanasakuntalam and Kumarsambhavam (Cantor I – VII); (2) Bhavabhuti's Uttararamcharitam and Malatimadhavam; (3) Bharavi's Kiratarjuniyam; (4) Banabhatta's Kadambari (Purvardha).
(iii)	**PALI :**	
	Paper – I :	(a) Pali linguistics; (b) Pali grammar; (c) Translation from Pali (Prose and Poetry) into English, Translation from English into Pali.
	Paper – II :	History of Pali Literature (Canonical and Post-canonical) History of Buddhism, Texts (meant for general acquaintance and not for minute study): (1) Dighanikaya (P.T.S.), Vol. II (pp. 72-252), Vol. III (pp. 58-193), (2) Majjhima-Nikaya (P.T.S.) Suttas (Nos. 26-40 and 81-90), (3) Mahavagga (Oldenberg's Edn.) pp. 1-100, (4) Milindapanha (Ed. By Trenckner), pp. 1-89, (5) Suttanipata-Uragavagga and Attakavagga, (6) Dhammapada-The Whole, (7) Therigatha (P.T.S.) – The whole.
(iv)	**ARABIC :**	
	Paper – I :	(a) Arabic linguistics; (b) Arabic grammar; (c) Translation from Arabic into English; (d) Translation from English into Arabic; (e) Arabic rhetoric and prosody.
	Paper – II :	(a) History of Arabic literature; (b) Texts (meant for general acquaintance and not for minute study) : (1) Diwan-Ibn-ul-Fariz; (2) Sab'a Mu'allaqa; (3) Sirat-Ibn-i-Hisham; (4) Muqaddama-Ibn-i-Khaldun.
(v)	**PERSIAN :**	
	Paper – I :	(a) Persian linguistics (Persian and Indo-European family of languages; Aryan or Indo_Iranian branch, evolution of Persian language, Old Persian, Avestan language, Middle Persian or Pahlavi, Modern Persian, Iranian dialects, Persian influence on Indian languages); (b) Persian grammar; (c) Translation from Persian into English; (d) Translation from English into Persian; (e) Persian rhetoric and prosody.
	Paper – II :	(a) History of Persian literature (Origin of Persian poetry, Early poets, Development of poetic forms-qasida, ghazal, masnavi,, etc. Growth of poetic themes or trendsepic, romantic, mystical, philosophical, ethical, etc. Survey of prose-works-historical, mystical, ethical, biographical, etc. Literary progress in different periods of Iranian history. Contributions of eminent poets and writers. Modern poetry, Modern prose, Indo-Persian literature); (b) Texts (meant for general acquaintance and not for minute study) : (1) Shahnama of Firdausi; (2) Chahar Maqala of Nizami Aruzi; (3) Qasaid-i- Khaqani; (4) Diwan-i-Hafiz; (5) Masnavi of Jalaluddin Rumi; (6) Naldaman of Fayzi.
(vi)	**FRENCH :**	
	Paper – I :	Translation from French into English, Translation from English into French, French Grammar.
	Paper – II :	History of French Literature, Texts, Texts (meant for general acquaintance and not for minute study) : (1) Prose-Ronsard : Deveres choisies (Classique Larosusse) – 2 volumes, Pierre Loti; La roman d'um enfant; (2) Poetry-Ronsard : Poesies choisies (Classique Larosusse)-2 volumes. Musset : Poesies nouvelles. Drama-Moliers : L'Avare, Corneilles : La Cid.
(vii)	**BENGALI :**	
	Paper – I :	(a) Bengali Linguistics; (b) History of Bengali Literature; (c) Old Bengali Texts (Poetry and prose) up to Iswarchandra Gupta. Texts (meant for general acquaintance and not for minute study) : The Charyapadas, The Srikrishnakirtan and Lyrics of Chandidas, Vidyapati, Jnandas and Govindadas, The Chaitanya-Bhagavata, the Ramayana of Krittivasa, The Mahabharata of Kasiram Das, Mangala Kavyas including Bharatchandra's Annadamangal, Poems of Syed Alaol, Lyrics of Ramprasad. The Eastern Bengali Ballads, Works of Iswarchandra Gupta.
	Paper – II :	Modern Bengali Poetry, Prose, Drama and Criticism.

(viii)	**HINDI :**	
	Paper – I :	(a) Hindi linguistics; (b) History of literature; Rhetoric and Prosody. Old Hindi Texts – Prose and Poetry. Text (meant for general acquaintance and not for minute study) : (1) Veer Kavya Sangrah (Chand, Narpati Nalha, Bhusan). Ed. By Udayanarayan Tripathi (2) Kabir Sangrah (Hindi Sahitya Sammelan); (3) Suffi Kavya-Sangrah. Edited by Pt. Parashuram Chaturvedi; (4) Ramcharitamanas-Tulsidas; (5) Bharmara-Geet-Saar-Surdas. Edited by Ramachandra Shukla, (6) Bihari-Satsai-Bihari; (7) Shabda-Rasayan-Deva. Edited by Dr. J.N. Singh Manoj; (8) Rasakhan aur Ghanananda (Nagri Prachar Sabha); (9) Astha Chhap. Edited by Dr. Dhirendra Varma.
	Paper – II :	Modern Hindi Poetry, Prose, Drama and Criticism.
(ix)	**URDU :**	
	Paper – I :	(a) Urdu linguistics; (b) History of Urdu Literature, Old Urdu Literature – Prose and Poetry. Texts (meant for general acquaintance and not for minute study) : (1) Diwani-I-Wali-100 Ghazals from the beginning; (2) Intikhab-e-Kalam-e-Mir by Dr. Abdul Haque; (3) Qasaid-I-Sauda : One qasaid only-beginning with the line "Hua Gab Kufr thabit hai wuh Tamha-Musalmani."; (4) Muthnavi Schrul Bayan by Mir Hassan Dehlavi; (5) Fasan-I-Ajaib by Rajab Ali Beg Saroor; (6) Araish-I-Muhfil by Haider Baksh Haidri.
	Paper – II :	Modern Urdu Poetry, Prose, Drama and Criticism.
(x)	**COMPARATIVE LITERATURE :**	
	Paper – I :	(a) Theories of Literature : Dates terms and Concepts. (b) Literature of the Ancient World; (i) Indian, (ii) Western (c) Bangla Sahitya : 1 (Baishnab Padabali theke Bankimchandra) (d) Bangla Sahitya : 2 (Rabindranath o Uttorkaal) (e) Bengali Literature in Translation (f) Indian Literature other than Bengali in Translation
	Paper – II :	Western Literature - (a) 800 – 1400 A.D. (including Song of Ronald, Tristan and representative writings of Troubadour Minnesang, Dante, Petrarch, Boccaccio and Chaucer). (b) 1400 – 1616 A.D. (including representative writings of Villon, Ronsard, Spencer, Machiavelli, Rableis, Montaigne and Shakespeare). (c) 1616 – 1749 A.D. (including representative writings of Moliere, Racine, Swift, Voltaire and Defoe). (d) 1749 – 1832 A.D. (including representative writings of Goethe, Schiller, Heine, Wordsworth, Coleridge, Shelley, Keats, Scott, Rene, Lamartine, Vigny, Hugo and Musset). (e) 1832 – 1910 A.D. (including representative writings of Whitman, Baudelaire, Verlaine, Laforgue, lbsen, Balzac, Tolstoy, Maupassant and Chekhov). (f) 1910 to the Present times (including representative writings of Yeats, Eliot, Frost, Rilke, Mayakovsky, Eluard, Neruda, Hervert, Kafka, Marquez and lonesco).
[Candidates are not permitted to take more than one of the optional subjects mentioned at serials 1(i) to 1(x). above]		
2.	**AGRUCULTURE :**	
	Paper – I :	Agricultural Chemistry and Soil Science.
	Paper – II :	Agricultural Botany; agricultural Entomology and Plant Pathology.
3.	**ANIMAL HUSBANDRY AND VETERINARY SCIENCE :**	
	Paper – I :	Animal Nutrition; Animal Physiology; Livestock Production and Management; Genetics and Animal Breeding.
	Paper – II :	Health and Hygiene : Animal Diseases : Veterinary Public Health : Milk and Milk Products Technology : Meat Hygiene and Technology : Extension.
4.	**ANTHROPOLOGY :**	
	Paper – I :	Meaning and scope of Anthropology; Relationship with other disciplines; Main branches of Anthropology, their scope and relevance : Social-cultural Anthropology, (b) Physical and biological anthropology, (c) Archaeological Anthropology; Human Evolution and emergence of Man; Phylogenetic status, characteristics and distribution of the following : (a) Prepleistocence fossil primates-Oreopithecus, (b) South and East African hominids-Plesianthropus/Australopithecus Africaus, Paranthropus, Australopithecus, (c) Paranthropus-Homo erectus javanicus, Homo erectus pekinensis, (d) Homo heidelbergensis, (e) Neanderthal man-La-chapelle-aus-saints (Classical type), Mt. Carmelites types (Progressive type), (f) Rhodesian man, (g) Homo sapiens-cromognon, Grimaldi, Chancelede; **Cultural Evolution**-broad outlines of pre-historic cultures : (a) Paleolithic, (b) Mesolithic, (c) Neolithic, (d) Chalcolithic, (e) Copper-Bronze age, (f) Iron age; **Family**; Concept of kinship; Marriage, Study of Culture and Civilization; Concent of Social Change and Cultural Change; Social structure and social organization, Role-analysis and social network, Institutions, Groups community. Social stratification : principles and form, status, class and power, gender. Nature and types of mobility; **Definitions and functions of religion**. Anthropological approaches to the study of religion-evolutionary, psychological and functional. Magic, witchcraft and sorcery; definitions and functions and functionaries; priest, saman, medicine man and sorcerers. Symbolism in religion and rituals, Ethno-medicine. Myths and rituals : definitions and approaches to their study – structural, functional and processual Relation with economic and political structures; Production, distribution and consumption, Economic Anthropology. Exchange : gifts, barter, trade, ceremonial exchange and market economy, Political organizations-band, tribe, chiefdom, state,

		concept of power, authority and legitimacy. Social control, law and justice in tribal and peasant societies; Culture ecology and sustainable development. Displacement and rehabilitation; Methods of anthropological study : Basic techniques of data collection. Interview, participant and other forms of observation, schedules, questionnaire, case-study methods, life histories and secondary sources; Concept scope and major branches of human genetics; Concept of race in histrogical and biological perspective. Race and racism, biological basis of morphological variation of non-metric and metric characters. Racial criteria, racial traits in relation to heredity and environment; Ethnic groups of mankind-characteristics and distribution in world, racial classification of human groups; Concepts and methods of Ecological Anthropology; Dynamics of ethnicity at rural, tribal, urban and international levels. Ethnic conflicts and political developments. Concept of ethnic boundaries. Ethnicity and concept of nation state; Concept of human growth and development-stages of growth-prenatal, natal infant, childhood, adolescence, maturity, senescence. Factors affecting growth and development-genetic, environmental, biochemical, nutritional, cultural and socio-economic. Ageing and senescence. Theories and observations – biological and chronological longevity. Human physique and somatotypes. Methodologies for growth studies; Reproductive biology, demography and population study. Fertility patterns and differentials. Demographic theories – biological, social and cultural; Demographic methods – census, registration system, sample methods, dual reporting system. Population structures and population dynamics; Biological and socio-ecological factors influencing fecundity, fertility, natality and mortality; Biological consequences of population control and family welface; Application of statistical principles in Physical Anthropology.
	Paper – II :	**Evolution of the Indian Culture and Civilization**-Pre-historic (Paleolithic, Mesolithic and Neolithic), Protohistoric (Indus Civilization). Vedic and post-Vedic beginnings. Contributions of the tribal cultures. **Demographic profile of India**-Ethnic and linguistic elements in the Indian population and their distribution. Indian population, factors influencing its structure and growth. **The basic structure and nature of traditional Indian social system**-a critique. Varnashram, Purushartha, Karma, rina and Rebirth. Theories on the origin of caste system, Jajmani system. Structural basis of inequality in traditional Indian society. Impact of Buddhism, Jainism, Islam and Christianity on Indian society. **Aspects of Indian village**-social organizations of agriculture, impact of market economy on Indian villages. **Linguistic and religious minorities**-social, political and economic status. **Tribal situation in India**- biogenetic variability, linguistic and socio-economic characteristics of the tribal populations and their distribution. Problems of the tribal communities. Developmental projects – tribal displacement and problems of rehabilitation : Development of forest policy and tribals, Impact of urbanization and industrialization on tribal and rural populations. Role of NGO. Problems of exploitation and deprivation of Scheduled Castes / Scheduled Tribes and Other Backward Classes; Constitutional safeguards for Scheduled Tribes and Scheduled Castes. Social change and contemporary tribal societies : Impact of **modern democratic** institutions, development programmes and welfare measures on tribals and weaker sections. Emergence of ethnicity, tribal movements and quest for identity. Pseudo-tribalism. Social change among the tribes during colonical and post-independent India. Impact of Hinduism, Christianity, Islam and other religion on tribal societies. Tribe and nation state-a comparative study of tribal communities in India and other countries. Role of anthropology in tribal and rural development. Contributions of anthropology to the understanding of regionalism, communalism and ethnic and political movements.
5.	**BOTANY :**	
	Paper – I :	Microbiology : Pathology : Cryptogams : Phanerogams : Morphogenesis.
	Paper – II :	Cell Biology : Genetics and Evolutions : Physiology and Biochemistry : Ecology : Economic Botany
6.	**CHEMISTRY :**	
	Paper – I :	**Atomic structure** : Quantum theory, Heisenberg's uncertainty Principle wave-particle duality, Schrodinger wave equation. Shapes of s, p and d orbitals. **Chemical Bonding** : Characteristics of ionic compounds, Lattice Energy, Born Haber Cycle, Covalent bonding – characteristics of covalent compounds. VB theory – concept of resonance. M O theory (LCAO Method). M.O. diagram of homo and heteronuclear diatomics. **Gaseous State** : Equation of state for real gases, Liquefaction of gases. **Thermodynamics** : First, Second and Third Law, Entropy, Free energy, Criteria for equilibrium. **Electrochemistry** : Debye-Huckel theory of strong electrolytes, Debye-Huckel Limiting Law, Galvanic Cells, Concentration Cells; Measurement of emf. Liquid junction potential, lonic equilibria. pH and its measurement. **Chemical Kinetics** : Differential and integral rate equations for zeroth, first, second and fractional order reactions. Determination of order. Consecutive, Opposing and chain reactions, Catalysis, General chemistry of d and f block elements. Lanthanide contraction. **Coordination Chemistry** : Werner's theory. Stereo-chemistry. Different types of isomerism. IUPAC nomenclature. Elementary Crystal Field theory – explanation of magnetism and electronic spectra. **Non-aqueous solvents** : Reactions in liquid So_2, NH_3, and HF. Modern theories of acids and bases-HSAB principle. **Bio-inorganic Chemistry** : Metal ions in biological systems and their role in ion-transfer across the membranes-ionophores, photosynthesis-nitrogen fixation, oxygen uptake proteins, cytochromes, ferredoxins.

	Paper – II :	**Reaction Mechanism :** (a) General methods of study : Use of isotopes, Cross-over experiments, Intermediate trapping, Energy diagrams, Thermodynamic control and Kinetic control of reactions. (b) Reaction intermediates : generation, geometry stability and reaction of carbonium ions, carbanions, free radicals, carbenes, benzynes and nitrenes. (c) Substitution reactions : SN1, SN2, SNi Mechanisms, Neighbouring group participation, Electrophilic Substitution. (d) Elimination reaction : E1, E2 and E1cb mechanism. Orientation in E2 reaction, Saytzeff and Hoffmann rule. (e) Nucleophilic and electrophilic addition reactions. (f) Rearrangements : Pinacol-pinacolone, Hoffmann, Beckmann, Bacyer-Villiger, Fries, Claiser and Wagner-Meerwein rearrangement. **Chemistry and Mechanism of reactions :** Aldol condensation, Claisen condensation, Perkin, Knoevanagel, Witting, Reimer-tiemann, Cannizzaro reactions, Stobbe, Benzoin and Acyloin condensation. Amino acid and Proteins. **Polymers :** (a) Polymer solutions and their thermodynamic properties. Average Molecular Weight-its determination. (b) Preparation and properties of polymers, Polyethylene, Polystyrene, PVC, Nylon, Teflon, Terylene, Polyesters, Synthetic and natural rubber, inorganic polymers-phosphonitrilic halides, borazines, silicones, silicates. (c) **Bio-polymers :** DNA and RNA **Synthetic uses of reagents :** $Os0_4$, $HI0_4$, $Cr0_3$, $Pb(OAc)_4$, $Se0_2$, NBS, B_2H_6, Liquid NH_3-Na, CH_3MgI, $LiA1H_4$, $NaBH_4$, n-Buli. **Environmental Chemistry :** Chemical toxicology : Toxic chemicals in the environment, biochemical effects of Arsenic, Cadmium, Lead, Mercury, Carbon monoxide, Nitrogen oxides, Sulphur dioxide, Ozone & PAN, Cyanide. Acid rain, Smog, Radioactive pollution, Effect of pesticides on atmosphere, industrial waste water treatment.
7.	**CIVIL ENGINEERING :**	
	Paper – I :	**Strength of Materials** : Simple stress-strain, Elastic constants, shear force and bending moment. Theory of simple bending. Strain energy in direct stress, bending and shear. deflection of beams by different methods. Torsion of shafts & transmission of power, Principal stresses & strains in two dimensions, Mohr's Circle, Theories of Elastic Failure. **Structural Analysis** : Castiglianio's theorems I & II and their application to beams and pinjointed trusses; Slope-deflection & moment distribution applied to indeterminate beams and rigid frames. Rolling-loads and influence lines for shear force and bending moments in beams. Influence lines for simply supported plain pinjointed trusses. Analysis of three hinged, two hinged and fixed arches. Matrix method of analysis by force method and displacement method in indeterminate beams and rigid frames. Plastic Analysis of beams and frames : Statical and Mechanism method. **Design of Structural Steel** : Rivetted-bolted and welded joints and connections. Design of tension and compression member, Beams of built up section, rivetted and welded plate girders, Stancheons with battens and lacings, Slab and gussetted column bases. **Design of Reinforced Concrete** : Concrete mix design, Working Stress and Limit State method of design; design of slabs, stair-case slabs, beams of rectangular, T and L sections; Compression members under direct load with or without eccentricity, Isolated and combined footings; Cantilever and Counterfort type retaining walls; Water tanks : rectangular and circular. **Prestressed Concrete** : Methods and systems of prestressing, anchorages, analysis and design of sections for flexure based on working stress, loss of prestress. Design of masonry wall and retaining wall. **Fluid Mechanics** : Flow through closed conduits and open channels, pipe net-work, Hydraulic Jump. Centrifugal and Reciprocal Pumps : types and characteristics. Principles of Hydropower Development : type, layout and component works. **Geotechnical Engineering** : Types of soil, classification and index properties. Effective stress and pore water pressure. Permeability and seepage. Compaction and consolidation, Shear strength and bearing capacity, Settlement. Footings : isolated and combined. Rafts. Pile foundation. Well foundation.
	Paper – II :	**Engineering Materials** : Physical properties of construction materials : stones, bricks. Mortars (sand-cement lime-surki), lime concrete and cement concrete. Properties of fresh and hardened concrete. Flooring Tiles. Timber : properties and uses, seasoning and preservation. Plastics, damp-proofing materials. Termite proofing, materials for low cost housing.

		Construction : Brick masonry : Bonds, jointing, plastering & pointing, types of floor and roof. Functional planning of buildings, Building estimates and specifications. Construction Equipment : Concreting equipments : mixer, vibrator, weigh batcher and batching plant. Earthwork equipments : power shovel hoc, bulldozer, dumper & rollers. Construction Planning & management : Job layout, bar charts, project control and supervision. Network analysis : CPM & PERT analysis, Float times, construction of network for cost optimization. Elements of Engineering Economics : benefit-cost, incremental analysis. **Survey and Transportation Engineering** : Survey : common methods of distance and angle measurements, plane table survey, levelling, traverse survey, triangulation survey, corrections, and adjustments, contouring, topographical map. Surveying instruments for above purposes. Techeometry. Circular and transition curves. Highway Engineering : Principles of highway planning. Highway alignments, geometrical design : Cross section, camber, superelevation, horizontal and vertical curves. Classification of roads : low cost roads, flexible pavements, rigid pavements. Design of pavements and their construction, evaluation of pavement failure and strengthening, Drainage of roads : Surface and sub-surface. **Hydrology, Water Resources and Engineering** : Hydrology : Hydrograph, flood frequency analysis, flood estimation. Ground water flow : Specific yield, seepage coefficient, coefficient of permeability, confined and unconfined aquifers, tube wells, ground water potential. Irrigation Engineering : Water requirements of crops : consumptive use, duty and delta, irrigation methods and their efficiencies. Canals : Most efficient section, lined canals, their design, regime theory, cost analysis of lined and unlined canals, drainage behind lining Water logging : Causes and control, drainage system design, salinity. Canal structures : Principles of design of canal falls, aqueducts. Diversion head work : Principles and design of weirs of permeable and impermeable foundation, Khosla's theory, energy dissipation, stilling basin. Storage works : Types of dams, design, Principles of design of rigid gravity and earth dams, stability analysis. **Environmental Engineering** : Water Supply : Estimation of surface and subsurface water resources, predicting demand for water. Impurities of water and their significance, physical, chemical and bacteriological tests. Waterborne diseases. Standards for potable water. Intake of water. Water treatment-Principles of coagulation, flocculation and sedimentation. Slow; rapid and pressure filters. Chlorination and softening. Water storage and distribution; storage and balancing reservoirs : types, location and capacity. Distribution system : layout, hydraulics of pipe lines. Sewerage systems : Domestic and industrial wastes. Storm sewage-separate and combined systems. Flow through sewers. Design of sewers and sewer appurtenances. Plumbing in buildings. Sewage characterization : BOD, COD, solids, dissolved oxygen, nitrogen and TOC. Sewage treatment : Working principles of units : Septic chambers, sedimentation tanks, trickling filters, oxidation ponds, activated sludge process. Design of septic tank, disposal of sludge, recycling of waste water. Treatment of industrial waste. Solid waste : Collection and disposal in rural and urban contexts. Environmental pollution : Sustainable development. Environmental impact assessment for river valley projects. Air pollution and pollution control measures.
8.	**COMMERCE AND ACCOUNTANCY :**	
	Paper – I :	(Accounting and Finance) : Financial Accounting : Cost Accounting : Taxation : Auditing : Business Finance and Financial Institutions.
	Paper – II :	Organization Theory and Industrial Relations.
9.	**COMPUTER SCIENCE :**	
	Paper – I :	Algorithms and Problem solving : Number systems and Arithmetic : Theory of Counting : Graphs and Algorithms : Boolean Algebra : Models of Computer Machines : Numerical Algorithms : Operations Research : Circuit and Network Theory : Basic Electronics : Instruments : Digital Logic and Systems : Data Communication : Data Structure.
	Paper – II :	Operating System : System Analysis and Design : Object oriented Programming, Computer Architecture and Organization : Micro Processor : Computer Networks : Database Management : Assembler, Loader and Linker : Compiler : Graphics and Multimedia.
10.	**ECONOMICS :**	
	Paper – I :	Micro-Economic Theory and Macro-Economic Theory (Market and Price Determination : Functions of Money : full employment and Say's Law : Modern Monetary System : Public Finance : International Economics : Growth and Development Economics).
	Paper – II :	Indian Economy (Evolution of Indian Economy till Independence : Indian Economics in Post-Independence Era.)
11.	**ELECTRICAL ENGINEERING :**	
	Paper – I :	**Electrical Engineering Materials** : Electrical/electronic behaviour of materials : conductivity, free-electrons and bandtheory; intrinsic and extrinsic semiconductor, p-n junction; solar cells, super-conductivity. di-electric behaviour of materials; polarization phenomena; piezo-electric phenomena, magnetic materials : behaviour and application, Photonic materials : refractive index, absorption and emission of light, optical fibres, lasers and opto-electronic materials. **Electrical Circuits and Network** : Circuit components; network graphs; KCL, KVL; circuit analysis methods : nodal analysis / mesh analysis; basic network theorems and applications; transient analysis : RL, RC and RLC circuits; sinusoidal steady state analysis; resonant circuits and applications; coupled circuits and applications; balanced 3-phase circuits. Two-port networks, driving point and transfer functions; poles and zeros of network functions. Elements of networks synthesis. Filter-theory : design and applications. Active filters. Circuit simulation : Input formats; methods of education foumulation; solution of equations; output formats; SPICE. **E.M. Theory** : Maxewell's equations, wave propagation in bounded media. Boundary conditions, reflection and refraction of plane waves. Transmission line : Distributed parameter circuits, travelling and standing waves, impedance matching, Smith chart. Waveguides : parallel plane guide, TE, TM and TEM waves, rectangular and cylindrical wave guides, resonators. Planar transmission lines; stripline,

		microstrip-line. **Analog and Digital Electronics** : Characteristics and equivalent circuits (large and small-signal) of Diode, BJT, JFET and MOSFET. Diode circuits : clipping, clamping, rectifier. Biasing and bias stability. FET amplifiers. Current mirror; Amplifiers : single and multi-stage, differential, operational, feed-back and power. Analysis of amplifiers; frequency-response of amplifiers. OPAMP circuits, Filters : sinusoidal oscillators : criterion for oscillation, single-transistor and OPAMP configurations. Function generators and wave-shaping circuits. Power supplies; Boolean algebra; minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinational circuits : arithmetic circuits, code converters, multi plexers and decoders. Sequential circuits : latches and flip-flops, counters and shift-registers. Comparators, timers, multivibrators. Sample and hold circuits, ADCs and DACs. Semiconductor memories. Logic implementation using MUXDMUX and programmable devices (ROM, PLA, FPGA). 8-bit micro-processor : memory interfacing, I/O,peripheral controllers, Multiprocessing Digital Computer architecture : overview, introduction to DOS, Advanced micro-processors. **Measurement and Instrumentation** : Error analysis; measurement of current voltage, power energy, power-factor, resistance, inductance, capacitance and frequency; bridge measurement. Electronic measuring instruments : multimeter. CRO, digital voltmeter, frequency counter, Q-meter, spectrum-analyser, distortion-meter, Transducers : thermocouple, thermistor, RTD, LVDT, strain-guage, piezo-electric crystal. Use of transducers in measurements of non-electrical quantities. Data acquisition systems.
	Paper – II :	**Control System** : Elements of control systems; block-diagram representation; open-loop & closed-loop systems; principles and applications of feed-back. LTI systems : time-domain and transform-domain analysis. Stability : Routh Hurwitz criterion, roofloci, Nyquist"s criterion, Bodeplots, Design of lead-lad compensators. Proportional, PL, PID controllers. State-variable representation and analysis of control systems. Principles of discrete-control system. **Electrical Machines & Energy Conversion** : principles of electromechanical energy conversion : Torque and emf in rotating machines. DC machines : characteristics and performance analysis; starting and speed control of motors. Transformers; principles of operation and analysis; regulation, efficiency; 3-phase transformers; 3-phase induction machines and synchronous machines : characteristics and performance analysis; speed control. Special machines : Stepper motors, brushless DC motors, permanent magnet motors, single-phase motors; FHP. **Industrial Electronics** : Semiconductor power devices : diode, transistor, thyristor, triac, GTO and MOSFET – static characteristic and principles of operation; triggering circuits; phase control rectifiers; bridge converters : fully-controlled and half-controlled; principles of thyristor choppers and inverters; basic concepts of speed control of dc and ac motor drivers applications of variable-speed drives. **Power Systems and Protection** : Steady-state performance of overhead transmission lines and cables; principles of active and reactive power transfer and distribution; per-unit quantities; bus admittance and impedance matrices; load flow; voltage control and power factor correction; economic operation; symmetrical components, analysis of symmetrical and unsymmetrical faults. Concept of system stability : swing curves and equal area criterion. Static VAR system. Basic concepts of HVDC transmission; FACTS. Introduction to energy control centers; SCADA and RTUs. Active power control : Speed control of generators, tie-line control, frequency control. Economic dispatch. Principles of over current, differential and distance protection. Concept of solid-state relays. Circuit breakers. Computer aided protection, introduction; line bus, generator transformer protection; numeric lays and application of DSP to protection. **Non-conventional Energy Sources** : Introduction to the energy problem; difficulties with conventional energy sources. Wind-Energy : Basics of Wind turbine aerodynamics; wind-energy conversion systems. Solar-Energy : Thermal conversion : photo-voltaic conversion. Wave-energy. Geothermal and Ocean thermal energy. Biomass. Importance of Energy Management : Energy audit; energy economics : discount rate, pay back period, internal rate of return, life cycle costing. **Analog and Digital Communication System** : Statistical averages; probability models; random signals and noise : white noise, noise equivalent band-width; signal transmission with noise; signal to noise ratio. Linear CW modulation : Amplitude modulation : DSB DSB-SC and SSB. Modulators and Demodulators; phase and Frequency modulation : PM & FM signals; narrowband FM; generation and detection of FM and PM, Deemphasis, Preemphasis. CW modulation system : Superheterodyne receivers, AM receivers, communication receivers, FM receivers, phase locked loop, SSB receiver Signal to noise ratio calculation for AM and FM receivers. **Fibre Optic Communication** : Optical properties of materials : Refractive Index absorption and emission of light, optical fibres, lasers and optoelectronic materials Fibre optic links. **Microwaves and Satellite Communication** : Electromagnetic radiation, propagation of waves : ground waves, sky wave, space wave, tropospheric scatter propagation, Extra-terrestrial communications. Antenna : Various types, gain, resistance, bandwidth, beamwidth and polarization, effect of ground. Antenna coupling : high frequency antennas; microwave antennas; special purpose antennas. Microwave Services : Klystron, magnetron, TWT, gun diodes, Impact, Bipolar and FETs, microwave integrated circuits. Microwave measurements. Satellite Communication : General overview and technical characteristics, earth station equipment, CNR of Satellite system. Radars & Pulsed systems : CW Doppler radar, FMCW radar, phase array radars. Television Systems; Television systems and standards, Black and White and Colour-TV transmission and receiver systems.
12.	**GEOGRAPHY:**	
	Paper – I :	Physical Geography (Geomorphology : Climatology) Soils and Vegetation : Oceanography : Eco-system; Human and Economic Geography (Development of Geographical Thought : Human Geography : Settlements Geography : Political Geography : Economic Geography and International Relations).

	Paper– II :	Regional Geography (A) Asia in general and India, Pakistan, China, Japan and South East Asia in particular. Europe in general and France, Germany, Great Britain and Russia in paricular. North America in general and Canada and U.S.A. in particular.
13.	**GEOLOGY :**	
	Paper– I :	General Geology :Geo-Morphology : Structural Geology : Palaeontology : Stratigraphy.
	Paper – II :	Crystallography : Optical Mineralogy : Mineralogy : Petrology : Economic Geology : Applied Geology.
14.	**HISTORY**	
	Paper– I :	**History of India** : Sources of History, Literature, Archaeology, etc. Harrappan Civilisation, origin, distribution, religious beliefs and practices, art and architecture, craft production and trade, script. Vedic society, economy, polity and religion. Jainism, Buddhism, ideological background, social structure. The Mauryan empire. The Guptas. The Post Gupta period – History of Bengal, Sasanka,the rise of the Palas, and Senas. Political History of the Sultanate, religion and culture, Sufism, Bhakti Movement, Nanak Kavir Nath Panthis, Sant tradition. Political History of the Mughals. Growth of regional polity, Rise of the Marathas, Mughal-Maratha conflict. Decline of the Mughal Empire and the Emergence of the Successor State with special reference to Bengal. Emergence of East India Company and Bengal Renaissance, cultural changes; Consolidation of the British power, framework of colonial governments, the different acts and statutes, the permanent settlement. Growth of Nationalism – ideas and movements upto 1947. Communalism and partition of India;; migration and rehabilitation of refugees, agrarian reforms, integration of princely states, framing of the Indian Constitution, Indian foreign policy, non-alignment of the Third World, social movements.
	Paper – II :	**World History** : Feudal Society in Europe, the Tenth Century crisis, the collapse of feudal order in Western Europe and the forms of survival in Eastern Europe. The age of discovery, science and technology, economic expansion of Europe in 16th century, Renaissance and Humanism. Formation of the early modern state, the making of absolutism and the problem of Church vs. the State-the Anglican compromise, the French religious wars and the political crisis. The 17th century economic expansion of Europe, civil war in England, settlement of 1688, beginning of liberalization, the ideas of John Locke. Crisis in France in 1780's and the role of philosophers, the French Revolution, rise and fall of Napoleon Banaparte, Emergence of national states in Central Europe, Vienna Congress, unification of Italy and Germany, modernization of Russia, emancipation of the serfs and liberal reforms in Russia, industrialization in Europe, rise of the working class and the socialist thought. American war of Independence – Bill of Rights, Growth of Federalism – The Civil War – Market Economy. The German reich under Bismarck, European imperialism, the First World War – its origin and impact, the Russian Revolution and the Bolsheviks, Peace settlement in 1919 – the development of the power of the Soviet State – rise of Fascism in Italy – the Economic Depression – the Nazy power – the outbreak of the Second World War. Chinese Revolution of 1949.
15.	**LAW :**	
	Paper – I :	Constitutional Law of India :International Law : Jurisprudence.
	Paper – II :	Law of Crimes and Torts : Law of Contracts and Mercantile Law : Indian Evidence Act.
16.	**MATHEMATICS :**	
	Paper – I :	Linear Algebra : Calculus : Geometry : Ordinary Differential Equations : Vector Analysis : Tensor Analysis : Statics : Dynamics : Hydrostatics : Special Theory of Relativity.
	Paper – II :	Algebra : Real Analysis : Complex Analysis : Partial Differential Equations : Mechanics : Hydrodynamics : Numerical Analysis and Computer Programming : Probability and Statistics.
17.	**MANAGEMENT :**	
	Paper – I :	Organizational Behaviour and Management Concept : Economic Environment : Quantitative Methods.
	Paper – II :	Marketing Management : Production and Material Management : Financial Management : Human Resource Management.
18.	**MECHANICAL ENGINEERING :**	
	Paper – I :	**Theory of Machines** : Kinematic and dynamic analysis of planar mechanisms. Cams, Gears and gear trains, Flywheels, Governors, Balancing of rotating masses. Balancing of single and multicylinder engines, Linear vibration analysis of mechanical systems (single degree and two degrees of freedom), Critical speeds and whirling of shafts, Belts and chain drives. **Mechanics of Solids** : Simple stress and strains, Plain stress problems, Mohr's construction, linear elastic materials, Stress-strain relations, uniaxial loading, thermal stresses. Beams : Bending moment and shear force diagrams bending stresses and deflection of beams, shear stress distribution. Torsion of shafts, helical springs. Combined stresses, thick and thin walled pressure vessels. Struls and columns, Strain energy concepts and theories of failure. **Engineering Materials** : Basic concepts on structure of solids, crystalline materials, Defects in crystalline materials, Alloys and binary phase diagrams, structure and properties of common engineering materials. Heat treatment of steels. Plastics, Ceramics and composite materials, common applications of various materials. **Manufacturing Science** : Marchant's force analysis, Taylor's tool life equation, machinability and machining economics, rigid, small and flexible automation, NC, CNC. Recent machining methods. EDM, ECM and ultrasonics. Application of lasers and plasmas, analysis of forming processes. Jigs, fixtures, tolls and gauges, Inspection of length, position profile and surface finish. **Manufacturing Management** : Production Planning and Control, Forecasting-moving average, exponential smoothing. Operations scheduling, assembly line balancing. Product development. Breakeven analysis, capacity planning. PERT and CPM. Control Operations : Inventory control – ABC analysis EOQ

		model. Materials requirement planning. Job design, Job standards, work measurement, quality management-quality control. Operations Research : Linear programming-Graphical and Simplex methods. **Elements of Computation** : Computer Organization, Flow charting. Features of common Computer Languages – FORTRAN and elementary programming.
	Paper – II :	**Thermodynamics** : Basic concept. Open and closed systems. Applications of Thermodynamic Laws. Gas equations, Availability, Irreversibility and Entropy. **I.C. Engines, Fuels and Combustion** : Spark ignition and compression ignition engines, four stroke engines and two stroke engines, mechanical, thermal and volumetric efficiency, heat balance. Combustion process in S.I. and C.I. engines, preignition detonation in S.I. engine, diesel knock in C.I. engine. Choice of engine fuels. Octane and Cetane ratings. Alternative fuels Carburration and Fuel injection. Engine emissions and control. Stoichometric air requirements and excess air factor, fuel gas analysis. **Heat Transfer, Refrigeration and Air Conditioning** : One and two dimensional heat conduction. Heat transfer from extended surfaces, heat transfer by forced and free convection. Heat exchangers. Radiation laws, heat exchange between black and non black surfaces. Network Analysis. Heat pump refrigeration cycle and systems, condensers, evaporators. Properties and choice of refrigerant, Refrigeration Systems and components, psychometrics, comfort indices, cooling loading calculations. **Turbo-machines and Power Plants** : Continuity, momentum and Energy Equations. Adiabatic and Isentropic flow, Fanno lines. Rayleigh lines. Theory of axial flow turbines and compressors, Flow through turbo-machine blade, cascades, centrifugal compressor. Dimensional analysis and modelling. Modern high pressure, high duty boilers, draft and dust removal equipment, Fuel and cooling water systems, heat balance, station and plant heat rates, Hydraulic turbines and centrifugal pumps.
19.	**MEDICAL SCIENCE :**	
	Paper – I :	Human Anatomy : Human Physiology : Biochemistry : Pathology : Microbiology : Pharmacology : Forensic Medicine and Toxology.
	Paper – II :	General Medicine : General Surgery : Obstetrics and Gynaecology including Family Planning : Preventive and Social Medicine.
20.	**PHILOSOPHY :**	
	Paper – I :	History and Problems of Philosophy (European and Indian).
	Paper – II :	Socio-Political Philosophy : Philosophy of Religion : Psychology and Ethics.
21.	**PHYSIOLOGY :**	
	Paper – I :	Biochemical and Biophysical Basis of Life Processes, Alimentation, Metabolism and Nutrition : respiration, Kidney and Secretion of Urine, Blood and its Circulation.
	Paper – II :	Nerve Muscle Physiology : Nervous System : Sense Organs : Endocrine Organs : Reproduction : Skin : Regulation of Temperature.
22.	**PHYSICS :**	
	Paper – I :	**Particle Dynamics** : Centre of mass and laboratory coordinates. Conservation of linear and angular momentum. The rocket equation. Degrees of freedom. Generalized coordinates and moments. Lagrange's equation and application to linear harmonic oscillator. Simple pendulam and central force problems. **Special Relativity** : Michelson-Morley experiment and its implications. Lorentz transformation – length contraction, time dilation, addition of velocities, aberration and Doppler effect, mass-energy relation, simple application to a decay process. **Waves** : Simple harmonic motion, damped oscillation, forced oscillation and resonance, Beats, Stationary Waves in a string, pulses and wave packets. Phase and group velocities. Reflection and Refraction from Huygen's principle. **Geometrical Optics** : Laws of reflection and refraction from Fermat's principle. Matrix method in paraxial optic-thin lens formula, nodal planes, system of two thin lenses. Chromatic and spherical aberrations. **Physical Optics** : Interference, Diffraction, Polarization optical activity. **Fibre Optics** : General principle. Classification of fibres. Advantages. Application. **Lasers** : General principle. Salient features-directionality, intensity, monochromaticity, coherence. Einstein's A and B coefficients; Ruby, He-Ne, Semiconductor, Quantum-well, Distributed-feedback edge emitting and vertical cavity surface-emitting lasers. **Electrostatics** : Laplace and Poisson equations in electro-statics and their application. Energy of a system of charges. Potential and field due to dipole, force and torque on a dipole in an external field. Dielectrics. **Magnetism** : Magnetic shell, uniformly magnetized sphere, ferromagnetic materials, hysteresis. **Current Electricity** : Kirchoff's Laws and their application; Biot-Savart law, Ampere's law, Faraday's Law, Lenz's Law, Self and mutual inductances, Mean and rms values in AC circuits, LRCR and LCR circuits-series and parallel resonance. Black body radiation, Planck's Law, Stefan Boltzmann Law, Wien displacement Law, Rayleigh-Jeans Law, Planck mass, Planck-length, Planck time, Planck temperature and Planck energy. **Thermodynamics** : Laws; reversible and irreversible processes; entropy; iso-thermal, adiabatic, isobaric and isochoric processes.

	Paper – II :	Vander Waal's equation of state for real gas. Critical constants. Maxwell-Boltzmann distribution of molecular velocities. Equipartition and virial theorems. Specific heat of solids, Clausius-Clapeyron equation. Adiabatic demagnetiszation. Joule-Kelvin effect. Liquefaction of gases. **Statistical Physics** : Saha ionization formula, Bose-Einstein condensation, thermodynamic behaviour of an ideal Fermi gas, Chandrasekhar limit. **Quantum Mechanics** : Wave particle duality, Schroedinger equation, Uncertainty principle, Solution of the one dimensional Schroedinger equation, Particle in a box. **Atomic Physics** : Stern-Gerlach experiment, electron spin, fine structure of hydrogen atom, L-S coupling, J-J coupling, Zeeman effect, Frank-Condon principle. **Molecular Physics** : Rotational, vibrational and electronics spectra of diatomic molecules, Raman effect, NMR, Fluorescence and Phosphorescence. **Nuclear Physics** : Binding energy, Meason theory, Shell model, Nuclear reaction-fission-fusion, Nuclear reactors. **Solid State Physics** : Energy band in solids, Metal, insulator, semiconductor, Elements of super conductivity. **Electronics** : Properties of semiconductors; Junction diodes; Amplifiers and Oscillators; Integrated circuits, operational Amplifiers; field effect transistors, JFET, MOSFET; Thermistors, Solar cells, Principles of holography.
23.	**POLITICAL SCIENCE :**	
	Paper – I :	**Group – A :** **Political Thought**-Plato, Aristotle, Machiavelli, John Stuart Mill, Hegel and Marx, Lenin and Mao Zedong. **Indian Political Thought**-Manu, Kautilya, M.N. Roy, Gandhi, Ambedkar. **Political Concepts**-State, society, sovereignty, power, citizenship, nation, global, order and imperialism. **Political Ideas**-Rights, liberty, euality, justice, rule and law, civil society, swaraj, revolution, democratic participation. **Political Ideologies**-Liberalism, Marxism, Socialism, Fascism, extremism. **Democracy and Human Rights**-Meaning and theories of Democracy, electoral system, forms of representation and participation, political accountability. **Party System and Political Process**-Theories, national and regional parties, patterns of coalition politics, interest and pressure groups. **Forms of Government**-Parliamentary & Presidential, Federal & Unitary modes of decentralization. **Social Movements**-meaning, theories and forms, role of non-governmental organizations. Nationalism & Internationalism. **Group – B :** **Indian Government & Politics**-Constitutional development in India during British rule-historical perspective. **Constituent Assembly**-Salient features of the Indian Constitution, philosophical & socio-economic dimensions. **Nature of Indian Federalism**-Centre-state relations, politics & regional movements and national integration. **Fundamental Rights**-Judicial interpretation & socio-political realities, fundamental duties. The union executive, President, Prime Minister and the Council of Ministers, constitutional provisions and current political trends. **Parliament**-Powers, functions of the Lok Sabha & Rajya Sabha, functioning of the Parliamentary system in India. **The Judiciary**-The Supreme Court, judicial review, judicial activism, public interest litigation, judicial reforms. **The State Executive**-Governor, Chief Minister and the council of Ministers, constitutional provisions and political trends. **Local Government & Politics**-Panchayati-raj & Municipal Government, structure, powers and functions, political realities, significance of 73rd & 74th amendments, role of women in Panchayats.

		Bureaucracy & Development-its changing role in independent India, bureaucratic accountability. **Challenges to Indian Democracy**-(a) communalism, regionalism, violence, criminalization & corruption. (b) Regional disparities, illiteracy, mass poverty, socio-economic inequalities among backward classes, growth of population and caste oppression.
	Paper – II :	**Public Administration & International Relations.** **Section – A : Public Administration** **Theories of Administration**-Scientific management, classical theory, bureaucratic theory, human relations school, participative management, the systems approach. **Forms of Public Organizations**-Ministers and departments, Corporations, Boards and Commissions, adhoc and advisory bodies, headquarters and field relationships. **Administrative Behaviour**-Decision making with special reference to Herbert Simon, theories of leadership communication, morale, motivation. **Accountability and Control**-Legislative, executive and judicial control over administration, citizen and administrative role of civil society, people's participation, right to information, administrative corruption, machinery for redressal of citizens's grievances. **Administrative Law**-Meaning and significance, delegated legislation, advantages, limitations, safeguards. **Development Administration**-Changing role of the District Collector, law and order and development management, relationship with functional departments, district administration and the Panchayat-raj institution role and function of the Sub-divisional Officer. **Public Services**-All India Services, constitutional position, role and functions, State Services and the State Public Service Commissions, training in the changing context of the Governments. **Control of Public Expenditure**-Parliamentary Control, Estimates Committee, Public Accounts Committee, Committee on Public Undertakings, Office of the Comptroller & Auditor General of India, role of the Finance Ministry in Monetory and Fiscal Policy, coordination in economy and expenditure. **Administrative Reforms**-Reforms since independence, reports of the administrative reforms commissions, problems of implementation. Administration of law and order and role of Central and State agencies in maintenance of law and order, criminalisation of politics and administration. **Welfare Administration**-Machinery at the National and State levels, Central and State Social Welfare Boards, special organizations for the Scheduled Castes & Scheduled Tribes, welfare programmes for women and children, problems of child labour. **Major Issues in Indian Administration**-Problem of Centre-State relations, relationship between political and permanent executives, values in public service and administrative culture, Lok Pal and Lok Ayuktas, development and environmental issues, impact of information technology on public administration, Indian administration and globalization. **Section – B : International Relations** **Concepts of International Politics**-Power, national interest, balance of power, national security, collective security and peace. **Determinants of Foreign Policy**-Domestic compulsions, geopolitics, geo-economics and global order. Origin and contemporary relevance of the cold war-nature of the post cold war global order. **Major Issues of World Politics**-Cuban Missile, Crisis, Vietnam War, Oil Crisis, Gulf War, collapse of the Soviet Union Yugoslav Crisis. **Non-Alignment**-Concept and movement, role of India, sociopolitical basis of non-alignment-domestic and global. **Major Issues in Indian Foreign Policy**-Sino-Indian relations, Indo-Pak conflicts and the liberation of Bangladesh, developments in Sri Lanka, Indian role in promoting regional cooperation through S.A.A.R.C., the Kashmir question and India becoming a nuclear power. India and South-East Asia : ASEAN. India's relations with U.S.A., China, Japan & Russia. India on the question of nuclear weapon, NPT and CTBT. India and the U.N. system-India's role in U.N. peace keeping and global disarmament. India and the emerging international economic order-the multi-lateral agencies viz., W.T.O., I.M.F., I.B.R.D., A.D.B. Regional organization such as the ASEAN, APEC, E.U., S.A.A.R.C., N.A.F.T.A.
24.	**PSYCHOLOGY :**	
	Paper – I :	Scope and Methods of Psychology : Human Behaviour : Cognitive Process : Learning : Remembering : Thinking : Intelligence : Motivation : Personality : Language and Communication : Attitudes and Values : Recent Trends : Models of Man.

	Paper – II :	Individual Differences : Psychological Disorders : Therapeutic Approaches : Application of psychology to Organizational Industrial Problems : Small Groups : Social Change : Psychology and the Learning Process : Disadvantaged Groups : Problems of Social Integration : Psychology and Economic Development : Management of Information and Communication : Problems of the Contemporary Society and of the Aged.
25.	**SOCIOLOGY :**	
	Paper – I :	Sociology; Social Stability; Social change; demographic; technological and cultural factors of social change; Theories of social change. Social order and Social conflict; Role conflict, Conflict of interests, ideas and values; Ideologies; Dialectics of change. Sociological thought; Comte, Spencer, Marx, Durkheim, Weber, pareto and their modern interpreters; Parsons and Merton. Social System; Equilibrium, status, role, culture, personality and socialization, heredity and environment, social control, conformity deviance, forms of interaction, social interaction and everyday life. Types of human groups. Power, authority, legitimacy, sociology of political life. Religion in relation to solidarity and social conflict, magic, science and morality. Economic : social aspects of production, distribution and consumption. Science & Technology : Ethos of science; social responsibility of science; social control of science; social consequences of science and technology; technology and social change. Sociological theory and empirical research, methods of social enquiry, surveys, questionnaires and interviews, participant and nonparticipant observation, experimentation in sociology, small group research.
	Paper – II :	Society and culture in India; unity and diversity; continuity and change. Approaches to the study of Indian society; Indological, Structural, functional, dialectic. Major groupings : religion, language, caste tribe. Major institutions : marriage, family, kinship patterns and changes affecting those; gender socialization; division of labour and economic interdependence, decision-making, centres of power and political participation; religion and society. Social inequality, nature and types; traditional concepts of hierarchy, caste and class; the Backward Classes; concepts of equality and social justice in relation to traditional hierarchies; education, occupation and social mobility; changing patterns of stratification. Social change in modern India : Westernization and Sankritization; directed and undirected change; legislature and executive measures; social reforms; social movements; urbanization; associations and pressure groups. Women and society : Demographic profile of women; special problems-dowry, atrocities, discrimination; existing programmes for women and their impact. Situational analysis of children; child welfare programmes. Globalization and ecological crisis in India-Environmental movements in India. Social problems in India : (1) Poverty in rural and urban areas, (2) Child labour, (3) Problem of youth, (4) Drug addiction, (5) Juvenile delinquency, (6) Old age problem, (7) Population problem, (8) Mass illiteracy.
26.	**STATISTICS :**	
	Paper – I :	Probability : Statistical Inference : Linear Inference and Multivariate Analysis : Sampling Theory and Design of Experiments.
	Paper – II :	Industrial Statistics : Optimization Techniques : Quantitative Economics and Official Statistics : Demography and Psychometry.
27.	**ZOOLOGY :**	
	Paper – I :	Non-Chordata and Chordata : Ecology : Ethology : Biostatistics : Economic Zoology.
	Paper – II :	Cell Biology : Genetics : Evolution and Systematic : Bio-Chemistry : Physiology : Embryology.