PUBLIC SERVICE COMMISSION, WEST BENGAL

WEST BENGAL CIVIL SERVICE (EXECUTIVE) ETC. EXAMINATION, 2012

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
Agriculture	11
Animal Husbandry and Veterinary Science	12
Anthropology	13
Botany	14
Chemistry	15

Subject	Code
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

BENGALI :	
Paper – I :	Section-A 1) Topics from the History of Bangla Language. a) The chronological track from Proto Indo-European to Bangla (Family tree with branches and approximate dates). b) Historical stages of Bangla (Old, Middle, New) and their linguistic features. c) Dialects of Bangla and their distinguishing characteristics. d) Elements of Bangla Vocabulary. e) Forms of Bangla Literary Prose-Sadhu and Chalit. 2) Process of Phonetic Changes in Bangla Language. Apinihiti (Anaptyxis), Abhishruti (Umlaut), Samibhavan (Assimilation), Svarabhakti / Viprakarsha, Svarasangati (Vowel harmony). 3) Problems of standardization and reform of alphabet and spelling and those of transliteration and Romanization. Section-B 4) History of Bangla Literature. a) Periodization of Bangla Literature: Old Bangla and Middle Bangla. b) Roots and reasons behind the emergence of modernity in Bangla Literature. c) Evolution of various Middle Bangla forms: Mangal kavyas, Vaishnava lyrics, Adapted narratives (Ramayana, Mahabharata, Bhagavata) and religious biographies. d) Narrative and lyric trends in the nineteenth century Bangla poetry. e) Development of prose. f) Bangla dramatic literature (nineteenth century, Tagore, Post-1944 Bangla drama). 5) Tagore and Post Tagoreans (upto the decade of fifties). 6) Fiction, major authors: Bankimchandra, Tagore, Saratchandra, Bibhutibhusan, Tarasankar, Manik. 7) Women and Bangla Literature. a) Swarna Kumari Devi, b) Ashapurna Devi, c) Mahasweta Devi, d) Rajlakshmi Devi, e) Kabita Singha, f) Nabanita Deb Sen
Paper – II :	Section - A 1) Vaishnava Padavali (Calcutta University Publication). Phases (Parjayas): Gourchandrika, Purvaraga, Abhisar, Mathur, Prarthona. 2) Chandimangal: Kalketu episode by Mukunda (Sahitya Akademi). 3) Meghnadbadh Kavya by Michael Madhusudan Dutta - 1st, 2nd and 3rd cantos. 4) Rajani by Bankimchandra Chattopadhyay. 5) Kapalkundala by Bankimchandra Chattopadhyay. 6) Samya and Bangadesher Krishak by Bankimchandra Chattopadhyay. 7) Punascha by Rabindranath Tagore. 8) Bichitra Prabandha by Rabindranath Tagore. 9) Chacha Kahini by Sayed Muztaba Ali. Section-B 10) Chandragupta by Dwijendralal Roy. 11) Grihadaha by Saratchandra Chattopadhyay. 12) Adhunik Bangla Kabita Selected Poems: i) Saswati by Sudhindranath Dutta

	ii) Rabindranath by Achintya Kumar Sengupta iii) Aami Kabi Jata Kamarer by Premendra Mitra iv) Bandir Bandana by Buddhadeb Basu v) Amar Koifiat by Kazi Nazrul Islam 13) Prabandha Samgraha by Pramatha Choudhuri: Selected Essays: Bharatchandra, Birbal, Boipara 14) Pather Panchali by Bibhutibhusan Bandyopadhyay 15) a) Ekaler Galpo Sanchayan - Vol.- 1 & 2 (Calcutta University Publication). b) Selected Stories: i) Payomukham by Jagadish Gupta ii) Haraner Natjamai by Manik Bandyopadhyay iii) Fossil by Subodh Ghosh iv) Tope by Narayan Gangyopadhyay v) Adab by Samaresh Bose vi) Aswamedher Ghora by Dipendranath Bandyopadhyay 16) Shrestha Kavita by Jibanananda Das. 17) Jagori by Satinath Bhaduri. 18) Ebam Indrajit by Badal Sircar.
HINDI :	
Paper – I :	<u>SECTION-A</u> 1. Hindi Linguistic and Grammatical References i. Definition of Language ii. Difference between learning and parole iii. Elements of Communication of Language iv. Different aspects of Language v. Units of language - Phonemes, Morphemes, Syntax, Discourse, Sementics. 2. History of Hindi language and Nagari Lipi i. History of Development of Hindi language (Short study) ii. Development of Khari Boli Hindi as literary language and Lingua Franka (Special context to Indian Freedom struggle and post Independent India) iii. Area of Hindi Language iv. Prominent Hindi dialects and inter relationship between the dialects v. Grammatical structure of standard Hindi vi. Scientific features of Nagari lipi vii. Development of Hindi as a global language in the modern context <u>SECTION-B</u> History of Hindi Literature: 1. Tradition of writing History of Hindi Literature 2. Literary trends of following four periods of Hindi Literature: a) Adikala b) Madhya Kala : i) Purva Madhyakala (Bhakti kala) (ii) Uttar Madhyakala (Riti Kala) c) Adhunika Kala A. ADIKALA- Prominent Poets and their works: i) Sarhapa and Goraknath ii) Chand Vardai and Narapati Nalha iii) Svambhu iv) Abdur Rahman and Amir Khusro B. PURVA MADHYAKALA (Bhakti kala) - Prominent Poets and their works: i. Sant Kavyadhara - Kabir and Sahjo Bai ii. Sufi Kavyadhara - Jayasi iii. Krish Kavyadhara - Surdas and Meerabai iv. Ram Kavyadhara -. Tulsidas C. UTTARMADHYAKALA (Ritikala) – Prominent Poets and their works : i. Ritibadh - Keshavdas ii. Ritisiddha - Bihari iii. Ritimukta -Ghananda

	D. ADHUNIK KALA 1. Trends of Navajagran (Renaissance) 2. Development of Hindi Prose and contribution of Bhartendu Mondal 3. Contribution of Mahavir Prasad Divedi towards the development of Hindi Prose 4. Prominent trend of Modern Hindi Poetry- Chahayavad, Pragtivad, Prayogvad, Nai Kavita, Samakalin Kavita and Ghazal, Sanavadi Kavita 5. Prominent Poets - Maithili Sharan Gupta, Prasad, Nirala, Mahadevi, Dinkar, Agyeya, Muktibodh, Nagarjun, Dushyant Kumar. KATH SAHITYA i) Development of Hindi Novels and short stories ii) Prominent writers-Premchand, Jainendra, Prasad, Renu, Bhishma Sahani, Yaspal, Chitra Mudgal, Mohan Rakesh and Krishna Sobti DRAMA AND THEATRE 1. Development of Hindi Drama and Stage 2. Prominent Dramatists-Bhartendu, Prasad, Mohan Rakesh, Lakshmi Narayan Lal 3. The development of Hindi Theatre CRITICISM 1. Development of Hindi Criticism 2. Prominent Critics -Ramchandra Shukla, Hazari Prasad Divedi, Ram Vilas Sharma
Paper – II :	(Textual studies of the prescribed text. This paper will test the critical and analytical aptitude of the candidates) SECTION-A 1. Kabir - Kabir Vani, ed. by Parasnath Tiwari, first 25 padas 2. Surdas - Bhramar Gitsar, ed. Ramchandra Sukla, first 25 padas 3. Tulsidas-Vinay Patrika-Geeta Press, first 15 padas 4. Bihari -Ritikavya Sanghra ed. Jagadish Gupta, first 25 dohas 5. Prasad -Kamayani (Shraddha and Ira Sarga) 6. Nirala -Saroj Smriti, Jago Phir Ek Bar 7. Mahadevi Varma - Mai Neer Bhari Dukh ki Badli, Ravindra ke Mahaprasthan Par 8. Agyeya-Asadhya Vina, Hamne Poudhey se kaha 9. Nagarjun-Bahut Dino Ke Bad and Pret ka Byan. 10. Dhumil-Mochiram, Roti Aur Sansad 11. Sarveshvar Dayal Saxsena -Tumhare Sath Rah Kar, Soundryabodh 12. Muktibodh - Mai Dur Hun, Bhool Galati SECTION-B 1. Bharatendu - Andher Nagri 2. Mohan Rakesh - Ashad Ka Ek Din 3. Ramchandra Shukla-Shraddha Aur Bhakti, Krodha 4. Premchand-Godan (Novel), Paush ki Raat, Badey Ghar ki Beti, Ahuti, Mukti Marg, Idgah (Stories) 5. Prasad - Dhruswamini 6. Phanishwar Nath Renu - Tisari Kasam, Panchlight, Rasapriya(Stories) 7. Manu Bhandari - Mahabhoj 8. Bhairv Prasad Gupta-Ganga Maiyya 9. Harishankar Parasai - Matadin Chand Par, Viklanga Shraddha ka Dor 10. Hazari Prasad Divedi-Vasant A Gaya, Devdar
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).
ENGLISH :	
Paper – I :	In Section A, candidates will have to write an essay. Texts for detailed study in Sections B and C are given below. SECTION-A : An essay on a literary topic

	SECTION-B 1. William Shakespeare- -*Macbeth -As You Like It* 2. Christopher Marlowe - *Edward II* 3. John Donne- - 'Canonization'; -' Death be not proud'; -'The Good Morrow' 4. Andrew Marvell-'To His Coy Mistress'; -'The Garden' 5. John Milton-'Lycidas'; -*Paradise Lost,* Book I 6. Alexander Pope - *The Rape of the Lock* 7. William Wordsworth- -'Ode on Intimations of Immortality'; -'Tintern Abbey' 8. Samuel Taylor Coleridge -'Kubla Khan'; -'Dejection: an Ode' 9. Percy Bysshe Shelley- - 'Ode to the Westwind' ; -' Ozymandias' 10. John Keats- -'Ode to a Nightingale' -'Ode on a Grecian Urn' 11. Alfred Tennyson-'Ulysses'; -'The Lotus Eaters'; -'Tithonus' 12. Robert Browning-'The Last Ride Together' 13. Elizabeth Barrett Browning-' How do I love thee!' SECTION-C 1. Jane Austen- *Pride and Prejudice* 2. Charles Dickens-Great *Expectations* 3. Thomas *Hardy-The Mayor of Caster bridge* 4. Mark *Twain-The Adventures of Huckleberry Finn* 5. Emily *Bronte-Wuthering Heights* *6.* Mary *Shelley-Frankenstein*
Paper – II :	In Section A, candidates will have to respond critically to an Unseen Passage. Texts for detailed study in Sections B and C are given below. SECTION-A Critical analysis/response to an unseen passage in prose/verse SECTION-B 1. W. B. Yeats-'Easter 1916'; -'Sailing to Byzantium'; -'Leda and the Swan' 2. T. S. Eliot- -'The Love Song of J. Alfred Prufrock'; -'The Journey of the Magi'; -'Burnt Norton' 3. W.H. Auden- -'In Memory ofW.B.Yeats'; -'Lay your sleeping head, my love'; -'The Shield of Achilles' 4. John Osborne-Look *Back in Anger* 5. Samuel *Beckett-Waiting for Godot* *6.* Sylvia Plath - -'Mirror'; - 'Nick and the Candlestick' 7. Henry Louis Vivian Derozio-'To India My Native Land'; -'My Country' 8. Kamala Das -' An Introduction' SECTION-C *1.* D.H. *Lawrence-The Rainbow* *2.* Raja *Rao-Kanthapura* 3. Amitava *Ghosh-The Shadow Lines* *4.* Chinua *Achebe-Things Fall Apart* *5.* James Joyce -*A Portrait of the Artist as a Young Man* *6.* Rabindranath Tagore - 'Crisis in Civilization' *7.* Virginia Woolf - 'A Room of One's Own'
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.

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.
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.
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.
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.
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, Ibsen, 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 Ionesco).
AGRICULTURE :	
Paper – I :	Agro-ecological factors- plant growth and distribution. Distribution of crops according to region. Role of climate and weather of crop production, weather forecasting including modern methods. Greenhouse effect and global warming. Precision farming- Remote Sensing (RS) and Geographic Information system (GIS). Cropping pattern and cropping system-distribution, objectives, types and impact on high yielding varieties, scope and limitations. Package and practices of cereals (rice, wheat, maize), pulses (green gram, black gram, red gram, lentil and peas), oil seeds (mustard, sesamum, ground nut, linseed, sunflower); fibre crops (Jute, sunhemp, mesta); sugarcane and forage crops (Sorghum, napier, para, berseem, Lucerne, ricebean, cowpea, oat, dinanath grass).

	Weeds- definition, characteristics, dessimination and control. Agroforestry-Definition of forest, scope of various types of forest - social forest, rural forest, urban forest, farm forestry; forest products. Aforestation. Conservation. Soil- definition, process and factors of soil formation, soil properties and soil conservation. Soilfertility - problems of soil and their reclamation. Nutrition- essential elements, role of nutrients on plants, integrated nutrient management and biofertilizers. Water use efficiency and dryland farming- water use efficiency in relation to crops production. Criteria for scheduling irrigation. Methods and systems of irrigation. Rainwater harvesting. Dryland farming - definition, prospects and problems. Techniques for establishment and management. Farm management - scope, importance and characteristics, farm planning, farm budgeting and farm operations. Agro-economics - function and crop insurance. Agril-extension - importance and role, methods of evaluation of extension programme. Role of KVK in technology transfer. Role and scope of Information Technology in Indian Agriculture. Livelihood management through agriculture (Self Help Group in agriculture). Marketing - its channels, pricing, marketing intelligence, storage with special references to cold storage and wirehouse. Distribution- public distribution system.
Paper – II :	Crop improvement- Cell structure and functions, law of heredity, chromosome structure and aberrations, polyploidy. Mutation breeding. History of plant breeding. Mode of reproduction, selfing and crossing techniques. Crop genetic resources - conservation and utilization. Application of principles of plant breeding. Breeding methods. Heterosis,somatic hybridization. Molecular markers, DNA finger printing and genetically modified crops. Principles of plant physiology; absorption, translocation, photosynthesis and respiration (definition, process, factors affecting and significance). Growth and development, photoperiodism, plant growth substances (definition, classification and role).Stress-physiology. Seed production, testing, certification and storage. Cultivation practices of major commercial fruits, vegetables, flowers, plantation and spices, medicinal and aromatic crops. Landscaping- principles, features and designs. Postharvest technology. Protected cultivation of horticultural crops. Pests and diseases of commercially important fruit, vegetables, flowers, plantation & spices, medicinal and aromatic crops. IPM. Food and nutrient security. Scope for export of agricultural products.
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.
ANTHROPOLOGY :	
Paper – I :	Meaning and scope of Anthropology; Relationship with other disciplines; Main branches of Anthropology, their scope and relevance : (a) 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 welfare; 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.
BOTANY :	
Paper – I :	*Microbiology*: Plant virus- types - TMV- Physiochemical characteristics and Multiplication, One step growth curve, Lytic cycle (T_4 phage) and Lysogenic cycle (Lambda phage), Significance of lysogeny, Viroids and Prions. Bacteria - Distinguishing features of Archaea and Bacteria, Flagella (ultrastructure) and Pilli, wall – chemical structure and differences between Gram +ve & Gram –ve bacteria, Bacterial genome and plasmid, Endospore – formation, structure and function. Genetic Recombination (Transformation, Transduction & Conjugation) Application in Medicine and Industry. *Plant Pathology*: Terms and Definitions: Disease concept, Symptoms, Etiology and causal complex, Endemic, Epidemic, Pandemic and Sporadic diseases, Disease triangle, Disease cycle (monocyclic, polycyclic and polyetic) with special reference to Late Blight of Potato, Brown Spot of Rice and Citrus Canker. Host – Parasite Interaction. Pathotoxin (Definition, criteria and example), Phytoalexin, Resistance. Plant Disease Management- Symptoms, Causal organism, Disease cycle and Control measures. *Cryptogams*: ALGAE: General account. Ultrastructure of cell. Diatom: Cell structure, Cell division, Auxospore formation in Centrales and Pennales. Economic Importance: Food, Phycocolloid (Agar-agar, Algin, Carrageenan), Diatomite, Algal Biotechnology – potential of microalgae for SCP, β-carotene, Biofertilizer, Biodiesel; Principles of mass cultivation of microalgae; Algal toxins. FUNGI & LICHEN: General Account: Hyphal forms, Fungal spore forms and mode of liberation, Sexual reproduction and degeneration of sex, Homothallism and heterothallism, Life cycle patterns, Anamorphic fungi and parasexuality, Mycotoxins with emphasis on aflatoxin. Mycorrhiza: Role in Agriculture & Forestry. Fungal Biotechnology: Mushroom, Cheese and Ethanol- Industrial production (brief outline), Fungal sources and uses of Mycoprotein, Enzyme (Cellulase), Amino acid (Tryptophan), Vitamin (Riboflavin), Antibiotic(Griseofulvin), Pharmaceuticals (Cyclosporin-A). Lichen : Types, Reproduction , Economic and ecological importance. BRYPOPHYTES : General Account and Origin of Alternation of Generations (Homologous and Antithetic theory), Evolution of Sporophytes (Progressive and Regressive concept). Importance: Role of bryophytes in Plant succession and Pollution Monitoring.

	PTERIDOPHYTES: General Account: Colonisation and rise of early land plants. Fossil Pteridophytes: Structural features, Geological distribution and Evolutionary significance. Telome concept and its significance in the origin of different groups of Pteridophytes. Heterospory and Origin of Seed habit. Economic importance as food, medicine and Agriculture. *Palaeobotany & Palynology:* Plant Fossil: Types, Different modes of preservation, Nomenclature and Reconstruction, Importance of fossil study. Geological time scale with dominant plant groups through ages. Palynology: Pollen aperture types, NPC classification (Erdtman). Pollen wall- Sporopollenin, Stratification and Ornamentation (sculpturing), Applied Palynology:- Palaeopalynology,.Aeropalynology , Forensic palynology, Melissopalynology. Phanerogams: GYMNOSPERMS : Progymnosperms: Phylogenetic importance. Fossil gymnosperms: Structural features of *Cycas*, *Pinus, Lyginopteris, Williumsonia oldhamia* and Geological distribution of reconstructed genera. Economic Importance of fossils with reference to Wood, Resins, Essential oils, and Drugs. MORPHOLOGY OF ANGIOSPERMS: Inflorescence types with examples. Flower: Corolla- forms, aestivation; Stamen- types; Placentation- types; Ovule - structure and forms. Fruit - types with examples. TAXONOMY OF ANGIOSPERMS: Components of Systematics: Nomenclature, Identification, Classification; Taxonomy and its phases - Pioneer, Consolidation , Biosystematic and Encyclopaedic ; alpha- and omega- taxomony . Nomenclature: Herbaria and Botanical Gardens – their role; important Indian Herbaria and Botanical Gardens; Dichotomous keys – indented and bracketed, Phenetics. Brief idea on Phenetics, Numerical taxonomy; Cladistics; Monophyletic, polyphyletic and paraphyletic groups; Plesiomorphy and apomorphy. Data sources in Taxonomy: Supportive evidences from: Phytochemistry, Cytology and Anatomy. Diagnostic features, Systematic position of Economically important plants (parts and uses) with special reference to the families Poaceae, Orchidaceae, Brassicaceae, Fabaceae, Solanaceae and Malvaceae. *Embryology:* Pre-fertilisation changes: Microsporogenesis and Microgametogenesis, Megasporogenesis. Post-fertilization changes. Embryogenesis and Development of Endosperm, Apomixis, Apospory and Apogamy, Polyembryony. *Anatomy:* Ultrastructure and chemical composition of cell wall. Stomata: Types, Ontogeny of Trachea and Sieve-tube. Stele: Stelar types & evolution/ Secondary growth with special reference to the abnormal growth in *Dracaena, Boerhaavia* and *Bignonia*. Mechanical tissues and the Pinciples governing their distribution in plants. Organisation of shoot apex (Tunica–Corpus) and Root apex (Korper-Kappe), Adaptive anatomical features of Hydrophytes and Xerophytes. *Ecology:* Habitat and Niche, Ecotone and edge–effect, Carrying capacity. Community ecology: Community- Characteristics and diversity, Ecological succession –Primary and secondary, Seral stages (with reference to Hydrosere), autogenic and allogenic succession. Plant indicators (metallophytes); Phytoremediation. Conservation of Biodiversity (*In-situ & Ex-situ*). *Plant Geography:* Phytogeographical regions; Endemism; Endemic types and Factors; Age & Area hypothesis and Epibiotic theory; Endemism in Indian flora with special emphasis on Sunderban and Eastern Himalayas.
Paper – II :	*Cell & Molecular Biology* CELL BIOLOGY: Cell and its types (prokaryotic and eukaryotic), structure and functions of the major cell organelles (nucleus, mitochondria, chloroplast, ribosome, endoplasmic reticulum, Golgi bodies, microbodies), cell division (mitosis and meiosis), significance of cell division, Cell cycle, structure of a typical chromosome, nucleosome model of chromosome, chromosomal aberrations (deletion, duplication, translocation and inversion), Concept of RNA world. MOLECULAR BIOLOGY: Chemical structure and nature of the nucleic acids, concept of gene, replication of DNA, concept of genomic DNA and cDNA, split genes, overlapping genes, oncogenes, genetic code,

	protein synthesis in prokaryotes and eukaryotes, central dogma, basic of recombinant DNA technology (restriction enzymes, vectors, molecular cloning, application of R DNA technology and its social ethics). *Genetics, Plant Breeding, Biometry & Evolution Biology:* GENETICS: Mendelian principles (Mendel's monohybrid and dihybrid experiments and laws), concept of linkage and crossing over, polyploidy, multiple alleles, point mutation, sex-linked inheritance, cytoplasmic inheritance and basic population genetics. PLANT BREEDING: Objective of plant breeding, methods of propagation in relation to breeding methods, methods of plant breeding (selection, hybridization, concept and causes of heterosis). Maintenance of germplasm, Heterosis and hybrid seed production, Molecular Breeding (use of DNA markers in plant breeding). Maintenance of germplasm, Mass selection and pure line selection, Heterosis and hybrid seed production, Molecular Breeding (use of DNA markers in plant breeding). BIOMETRY: Random sampling, Frequency distribution, Central tendency– Arithmetic Mean, Mode and Median, Measurement of dispersion – Standard Deviation, Standard error of Mean, Test of significance: 't'- test; chi square test for goodness of fit. Probability, Measurement of gene frequency (Hardy-Weinberg equilibrium). Overview of Bioinformatics, nature of biological data, literature databases (searching and downloading), introduction and overview of biological databases, nucleic acid sequence databases, GenBank, Protein sequence databases, introduction to BLAST series. EVOLUTION BIOLOGY: Concept of biological evolution, evidence of organic evolution (taxonomic, geological, morphological and anatomical); Lamarckism, Darwinism and mutation theories of de Vries. *Physiology and Biochemistry*: Plant-water relations, Stomatal physiology-mechanism of opening and closing, Organic Translocation Photosynthesis, Photochemical reaction centres, Cyclic and noncyclic electron transport, Water splitting mechanism, photophosphorylation, Z-scheme, Calvin cycle – Biochemical reactions and stoichiometry, Photosynthetic efficiency of C_3 and C_4 plants and crop productivity, Photorespiration, Crassulacean acid metabolism. Respiration- EMP pathway, TCA cycle, ETS and oxidative phosphorylation, Oxidative pentose phosphate pathway and its significance, ß-oxidation of fatty acids and significance. Nitrogen Metabolism (symbiotic and non-symbiotic), structure and function of di-nitrogenase complex, ETS of di-nitrogenase, basic concept of *nif* and *nod* genes. Plant Growth Regulators (Auxin, Gibberellin, Cytokinin, Ethylene and Abscisic Acid). Photoperiodism and plant types, Phytochrome, Vernalisation, Concept of biological clock and biorhythm. Seed dormancy, Physiology of Senescence and Ageing. Stress Physiology. Biochemistry as the molecular logic of living organisms, axioms of living organisms, the major compounds of living beings; pH, buffers and basic bioenergetics, chemical structure and properties of water molecule, ionization of water, Henderson-Hasselbalch equation, titration curve and the concept of preparation of any buffer solution; biomolecules: general structure, properties, classification and metabolic importance of carbohydrates, proteins, lipids and nucleic acids; enzymes, basic structure (holoenzyme, apoenzyme, cofactor, coenzyme and prosthetic group), nomenclature and classification of enzymes according to IUBMB, mechanism of enzyme action (concept of active site of an enzyme, activation of free energy, principles of enzyme action, Fisher's and Koshland's models), enzyme kinetics (Michaelis-Menten equation and Lineweaver-Burk plot), reversible and irreversible enzyme inhibition, allosteric enzyme regulation and covalently modulated enzyme regulation, basic concept of ribozymes, abzymes and isozymes. *Pharmacognosy :* Pharmacognosy and its importance in modern medicine , Crude drugs, Drug evaluation Secondary metabolites, Interrelationship of basic metabolic pathways with secondary metabolite biosynthesis with special reference to *Cinchona, Ipecac, Adhatoda* and *Curcuma longa.* *Plant Biotechnology & Instrumentation:* Plant tissue culture and Micropropagation. Plant Genetic Engineering: Brief concept of different gene transfer methods. Transgenic plants. Principles and applications of simple, compound, confocal and electron microscopy, colorimetry, visible and UV-visible spectrophotometry, deferential centrifugation, PCR, RT-PCR, Gel Electrophoresis, Blotting (Southern, Northern and Western) and ELISA.
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, Ionic 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.
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.
COMMERCE & ACCOUNTANCY :	
Paper – I :	Financial Accounting: Accounting as a Financial Information System, Basic Concepts & Conventions, Accounting Standards, Final Accounts of Profit-seeking and Non-profit seeking organisations. Corporate Accounting: Issue, Forfeiture & Re-issue of Shares, Redemption of Preference Shares & Debentures, Buy-back of Shares, Company Final Accounts, Reconstruction of Companies, Preparation of Consolidated Balance Sheet. Cost & Management Accounting: Cost Concepts, Terms & Classification of Costs, Elements of Cost, Accounting for Material, Employee Cost and Overhead, Job costing, Process costing, Activity-based costing, Marginal Costing – CVP Analysis & Decision Making, Standard Costing, Budgetary Control, Funds flow & Cash Flow Statement, Accounting Ratios. Taxation: a) Income Tax – Definitions, Residential Status & Incidence of Tax of Individual, Computation of Total Income of an individual (various heads of income and deduction from Gross Total Income), Set off & Carry Forward.

	b) Indirect Tax i) WB VAT Act, 2003: Basic concepts, features, determination of tax payable, registration of dealer. ii) Central Sales Tax, 1956: Definition, incidence and levy of tax, exemption and exclusion, determination of turn over and tax payable, registration of dealer.
Paper – II :	Indian Financial System – Role of finance in an economy, components (instruments, markets, etc.), role of financial intermediaries, structure of Indian financial system, role of RBI, Commercial Banks and other Financial Institutions(LICI,UTI, SIDBI, SFCs, NABARD) Money Market – structure of Indian money market, discount houses, call money market, recent trends of Indian money market Capital Market – primary and secondary market, functionaries of stock-exchanges, concept of DMAT, role of SEBI. Business Laws i) Indian Contract Act, 1872 – Offer & Acceptance, Consideration, capacity of parties, free consent, void & voidable agreements, discharge of contracts. ii) Consumer Protection Act, 1986 – Rights of consumers; definition of consumer, manufacturer, complaints, unfair trade practices; composition and jurisdiction of District Forum, State Commission and National Commission. iii) Companies Act, 1956 – Types of companies, Memorandum and Articles of Association, Prospectus, Promotion and Incorporation of Companies, Directors, Company Meeting, Winding up. iv) Industrial Disputes Act, 1947 - Nature, Causes, and settlement of industrial disputes, workers' participation in management and collective bargaining. Auditing – Auditing procedures and techniques; internal control and internal audit; company audit – divisible profit, dividend and depreciation; Audit of Bank, Insurance and NGOs; Audit Report. Organisation Behaviour – Nature and Concept of Organisation; organisation structure; modern concepts of organisation theory; Leadership – theories and styles; Motivation – concept & theories; Quality of Work Life – meaning and impact.
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.
ECONOMICS :	
Paper – I :	1. Microeconomic Theory 2. Macroeconomic Theory 3. International Trade Theory 4. Public Finance 5. Statistics and Econometrics 1. Microeconomic Theory i. Consumer Theory ii. Production and cost- returns to scale, short run and long run costs iii. Market Structure-Perfect competition, Monopoly, Monopolistic Competition, Oligopoly iv. General Equilibrium and Welfare (optimality of perfect competition) v. Marginal Productivity Theory of Distribution 2. Macroeconomic Theory i. National Income Accounting ii. Economy in the long run, economy in the short run, Fiscal and Monetary policy using IS-LM, Growth Theory—Harrod-Domar Model, Solow Model, Endogenous Growth. 3. International Trade Theory i. Classical — Ricardo, Neoclassical – Hecksher- Ohlin ii. Imperfect competition and trade , Intra-industry trade iii. Trade Policy—Tariff, Quota iv. Current and Capital Account in Balance of Payments, Fixed and Flexible exchange rate systems v. Open economy macroeconomics — Mundell-Fleming model

	4. Public Finance a. Theory of externality and market failure b. Public Goods and Role of the Public Sector c. Budget — Different concepts d. Tax—indirect and direct, VAT, subsidy and transfers e. Public debt and its burden 5. Statistics & Econometrics 1. Measures of Central Tendency & Dispersion 2. Theory of Probability 3. Sampling Theory 4. Inference 5. Econometrics—Classical Linear Regression Model
Paper – II :	1. Development 2. The Indian Economy (a) Pre-independence period (b) Post-independence pre-liberalisation period (c) Post-liberalisation period (d) The West Bengal Economy 1. Development (a) Process of development Lewis Model Harris Todaro Model Demographic change and occupational transformation (b) Trade and Development Trade as an engine of growth (c) Planning vs. Market Model of Development Poverty and Inequality (d) Capability and Human Development including issues of Gender (e) Environment and development 2. The Indian Economy (a) Pre-independence Land system Commercialisation of agriculture Deindustrialisation Drain Theory Development of Indian Railways (b) Post-independence Planning models and experience till Seventh Plan Change in composition of national income—Agriculture, Industry & Services. Agriculture—Green Revolution Industry—Role of Public Sector (c) Post-Liberalisation Changing role of Planning (from centralised to indicative, participatory and decentralised planning.) Salient features of NEP Progress in Reforms—1st and 2nd generation Reforms Role of WTO & IMF Monetary and Fiscal Policies Poverty and inequality (d) The West Bengal Economy-A historical perspective i. Brief economic history of the colonial period. ii. Economic & demographic consequences of Partition. iii. Evolution of Land and Tenancy Reforms (1950-1980) and its economic consequence iv. Changing composition of SDP v. Social development indicators-health, education, environment vi. West Bengal: in relation to other major States of India.
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.
GEOGRAPHY :	
Paper – I :	PRINCIPLES OF GEOGRAPHY (GROUP - A : PHYSICAL GEOGRAPHY) Geomorphology Nature and composition of earth's crust; Structure of earth's interior; Origin, distribution and permanency of Continents and Ocean Basins; Theories of isostasy, continental drift, and plate tectonics; Earth movements - types and effects; Fundamental concepts in geomorphology; Gradational processes - weathering and masswasting; Landforms due to fluvial. glacial. aeolian, coastal and karst processes; Evolution of landscape - cyclic and non-cyclic models; Global hydrological cycle. Climatology Atmosphere - nature, composition and structure; Elements and factors of weather and climate; Insolation and Heat-budget; General circulation of winds, Jet Streams and Monsoons; Condensation and Precipitation; Airmass and fronts; Tropical and Extra-tropical cyclones; Thunderstorm and tornado; Climatic classification - principles and application(Koppen, Thorntwaite, Trewartha); Global climatic changes. Oceanography Origin of continents and ocean basins; Bottom topography of ocean basins: Indian, Pacific & Atlantic Oceans; Nature, origin and characteristics of continental shelves and slopes, submarine canyons and coral reefs and atolls; Ocean currents: Indian, Pacific and Atlantic oceans; Physical and Chemical properties of ocean water: temperature, salinity and density; TS Diagram and Watermass; Ocean Deposits; Marine Resources. Environmental Geography Nature and composition of Biosphere; Concepts relating to Ecosystem - production and decomposition, homoeostasis, energy environment, productivity, food chain, food web, trophic structure, ecological niche, ecological pyramids, and ecological crisis; Ecosystem - principles and components; Components, Bio-energy Cycles and Biogeochemical cycles; Major Ecosystems of the world; Environmental degradation and conservation; Environmental pollution - land, water, air and noise; Natural hazards and natural disaster characteristics, mitigation and global efforts. Cartography The Earth as a Cartographic Problem - size and shape; co-ordinate system; scale and map projection; Principles and properties of Polar Zenithal. Conical. Cylindrical and Conventional projections (all normal case); Thematic mapping - types and techniques; Principles of Surveying and Levelling with Chain, Plane Table, Dumpy level and GPS; Remote Sensing nature and principles; Geographical Information System - evolution, components, and functionality. GROUP - B : HUMAN GEOGRAPHY Economic Geography Concepts and theories of resources; Locational analysis of agriculture (intensive subsistence in monsoon lands, extensive commercial farming in temperate lands, plantation farming in the tropics and dairy farming in the temperate grasslands), lumbering, fishing, mining (coal, petroleum and iron ore), power production (hydel and nuclear) and manufacturing (iron & steel, aluminium, and cotton textile); Economic models - landuse (Von Thunen), industry (Weber, Hoover, Pred). Economic systems and economic landscape - characteristics and evolution (Rostow, Myrdal, and Isard). Global economic blocks - patterns and functions. Population Geography Factors and measures of population growth; Malthus, Neo-Malthusianism, Optimum, Social and economic, Biological and natural and Demographic transition theories of population growth; Pattern of World population growth; Migration - nature, theories and consequences on society; Population distribution - density and global pattern; Global patterns and trends of population composition (age-sex structure and occupational structure). Social & Political Geography Concept of space: absolute & relative; Social structure: stratification and differentiation; Social Processes; segregation, adaptation, assimilation and integration; Heartland and Rimland theories; Principles of boundaries and frontiers Settlement Geography Origin and Growth of Settlements; Function, morphology, types and patterns of Rural settlements; Urban growth and urbanization; Classification, functions, and morphology of towns and cities; Models of urban growth - Burgess, Hoyt, Harris and Ullman, Mann.

	Urban gradients and densities; Residential areas - patterns and processes; The Central Business District - characteristics, delimitation and changes; The Central Place Theory and the Ranksize rule, The Urban field and inter-urban movement. Regional Development and Planning Regions - concepts, types and methods of regionalization; Regional diversity and disparities in development; Regional development - role of resource base, technology and information system, agriculture and industry, transport and communication, trade and commerce; Regional development theory - Perroux and Isard; Regional planning - basic principles and types; Environmental issues in regional planning and planning for sustainable development; Planning regions - concepts and delineation; State as a planning unit and micro-level planning with special reference to India.
Paper – II :	REGIONAL GEOGRAPHY <u>GROUP - A: GEOGRAPHY OF INDIA</u> Physical Geography Location and space relationship with neighboring countries; structure and Relief; Climate and Drainage; Soil and Natural Vegetation Resource Base Distribution, utilization and Conservation of Land (soil), Water (freshwater), Water Disputes interstate and neighboring countries, Mineral (iron ore, manganese, bauxite, mica), Energy (coal, oil, natural gas, and Non - Conventional sources like wind, tidal and solar power) and Biotic Resources Economy Indian agriculture - nature and characteristics; Development of Agriculture during the Plan periods; Green Revolution; Distribution and characteristics of cultivation of rice, wheat, jute cotton, tea, and coffee; Agricultural Regions, Industrial development and industrial policy during the Plan Period; Locational Dynamics, Growth and Development of the Iron & Steel, Aluminum, Engineering, Oil Refining, Cotton Textile, Jute, Sugar, Paper, cement and automobile industries; Growth and Development of Transport and Communication System (Road, Rail, Water, and Air); Nature and Development of Trade - national and foreign specially with the SARC and ASEAN countries; Trade Balance. Population Population as a Resource; Relation between Population and Socio-economic Development; Population Growth - spatial and temporal variations; Population Distribution and population - resource relationships; Population Composition and social implications age, sex, literacy, religion, and caste; Urban Growth and Urbanization - characteristics and patterns, factors and processes; Population Problems and Population Policy during the Plan periods. <u>GROUP - B: GEOGRAPHY OF WEST BENGAL</u> Physical Geography Location with Geographical Personality; Physiographic Divisions - structure and relief; Climate - seasonal weather conditions; Agro-climatic regions; Drainage systems and problems; Soil - types and fertility, erosion and conservation; Natural Vegetation - types and distribution, deforestation and afforestation. Resource Base Distribution, utilization and Conservation of Land, Water, Mineral, Energy (both Conventional and Non - Conventional) and Biotic Resources Economy Landuse - characteristics and correlates; Irrigation and Agriculture - development during the Plan periods; Rice, jute, and tea - cultivation, crop ecology, production and problems; Crop Combination Regions; Impact of Green Revolution; Industrial Regions - growth, development and problems; Trade and Transport - nature and status of development; issues of development Population Population as a Resource; Relation between Population and Socio-economic Development; Growth and Distribution (absolute, and density - crude, physiological and habitational); Population Composition - age, sex, literacy, occupation, religion, and caste; Urban Growth and Urbanisation - characteristics, patterns and factors; Population Problems and Population Policy during the Plan periods
GEOLOGY :	
Paper – I :	I. General Geology: Composition of the planets and meteorites. Abundance of elements in the universe and earth. Origin of the Earth. Internal constitution of Earth. Heat flow and geothermal gradient. Gravity, gravity anomalies on earth and Isostasy. Earth as a magnet, magnetic anomalies. Earth's internal processes, volcanism and global distribution of volcanoes. Earthquakes: causes, effects, earthquake belts. Seismic zones of India.

	II. Structural Geology: Stress and strain- basic concepts, analysis of stress-strain in two-dimension, stress and strain ellipse. Behavior of rocks under stress. Stress-strain relationships of elastic, plastic and viscous materials. Unconformity: different types and their recognition Fold and Fault: geometry and classifications, mechanisms. Fold and thrust belt. Shear zones and shear sense markers. Classification of joints, foliation, lineation and their relations with folds. III. Geomorphology and Remote Sensing: Basic concept of geomorphology, common landforms related to action of wind, river and glacier; coastal landforms. Geomorphology and its relation to structure and lithology. Aerial photographs and their interpretations. The Electromagnetic spectrum. Orbiting satellites and sensor systems. Indian remote sensing satellites. Applications of remote sensing in geology. Basic concepts of GIS and GPS. IV. Geotectonics: Continental drift and sea-floor spreading hypotheses, linear magnetic anomalies. Plate tectonics- types of plate-boundaries and their characteristic features. Island arc, continental rift system, active and passive continental margins. Palaeomagnetism. Mountain building and orogeny. V. Palaeontology: Definition, types and significance of fossils. Modes of preservation of fossils. Species concept in biology and binomial nomenclature. Index fossils and their significance. Description of hard-part morphology of brachiopoda, cephalopoda, pelecypoda and gastropoda. Evolutionary trend in Hominidae, Equidae and Proboscidae. Description and importance of Siwalik fauna, Gondwana flora and fauna. VI. Stratigraphy: Geologic time scale, Principles of determination of absolute and relative ages of rocks and geological events. Importance of unconformities in stratigraphy. Lithostratigraphic, biostratigraphic, magnetostratigraphic, chronostratigraphic and geochronologic units and their inter-relations. Geological evolution of Precambrian terrains of Dharwar, Singbhum and Rajasthan. Evolution of Proterozoic Cuddapah and Vindhyan basins. Geological evolution of the following Phanerozoic basins/ successions of India: Gondwana, Spiti, Kutch, Siwalik, Assam and Bengal. VII. Hydrology and Engineering Geology: Hydrologic cycle, vertical distribution of groundwater, porosity, permeability, hydraulic conductivity, transmissivity and storage coefficient. Aquifers: properties and classifications. Exploration for groundwater, groundwater recharge, rainwater harvesting. Groundwater provinces of India and West Bengal. Engineering properties of rocks. Geological investigations for dams, tunnels and reservoirs. Landslides: classification, causes and prevention.
Paper – II :	I. Mineralogy: Elements of crystal symmetry, Hermann-Mauguin symmetry notation. Crystal classes, crystal systems, crystallographic axes- interfacial angle and axial ratio. Crystal faces and linear directions, their nomenclature and interrelationship. Crystal forms in different crystal classes and crystal habits. Twining. Concept of space lattice, space group and unit cell. Physical properties of minerals. Classification of minerals on the basis of chemical composition. Crystal chemistry: bonding, coordination principles, isomorphism, polymorphism, solid solution, exsolution. Elementary thermodynamics. Structural classification of silicate minerals. Physical, chemical and optical properties of pyroxene, amphibole, feldspar and carbonate groups. Optically isotropic, uniaxial and biaxial characters of minerals. Pleochroism, birefringence, extinction angle, double refraction, interference figures and optic sign. II. Igneous Petrology: Forms of igneous rock bodies. Description and origin of common structures and textures of igneous rocks. Phase rule and its derivation; concept of the liquidus; one-, two- and three-component systems. Diopside-anorthite, forsterite-silica, albite-anorthite, diopside-forsterite-silica systems. Bowen's reaction series. Processes of diversification of igneous rocks: differentiation, assimilation, and partial melting.

	Basis of classification of igneous rocks and different classification schemes– CIPW norm; IUGS classification. Petrography and petrogenesis of: granite, basalt, anorthosite, alkaline and , ultramafic rocks. III. Metamorphic Petrology: Agents and types of metamorphism. Texture of metamorphic rocks, metamorphic crystallization. Classification of metamorphic rocks. Concept of metamorphic grade and metamorphic facies, facies series. Prograde and retrograde metamorphism. Metamorphism and tectonics. ACF, AKF diagrams. Regional metamorphism of pelitic and mafic rocks, and contact metamorphism of impure carbonate rocks. Metasomatism and granitisation. Migmatites. Granulite terrains of India. IV. Sedimentology: Processes of formation of sedimentary rocks, provenance, diagenesis and lithifaction. Textural components; Textural parameters- porosity, permeability. Classification of sedimentary rocks-terrigenous and chemogenic. Types of fluid. Aqueous fluid flow-current and wave. Primary sedimentary structures, their processes of formation and significance. Flow regimes, bed forms, their internal structures and fields of stability. Facies, facies association and facies models- fluvial, deltaic and beach-barrier bar systems. Sandstone, conglomerate and limestone: definition, composition, classification. V. Environmental Geology: Natural hazards – earthquake, tsunami, volcanic eruption, landslides, floods, and droughts. Impact of human activities on wetlands and forests, use of fertilizers on land. Pollution of groundwater, surface water and ocean. Composition of air, air pollution, effects of air pollution on human health. Impact of mining on atmosphere, biosphere, lithosphere and hydrosphere. Industrial and radioactive waste disposal. Environmental Protection, legislative measures, processes of mitigation. VI. Economic Geology: Classification of ore deposits, protore, ore, gangue, tenor and grade. Ore forming processes: magmatic, sedimentary, metamorphic, hydrothermal and supergene. Controls of ore localization, ore textures and structures. Metallogenic provinces and epochs. Geology of important metallic deposits of India: chromite, copper, iron, lead-zinc, manganese and uranium-thorium. Geology of important non-metallic deposits of India: bauxite, mica, phosphates, barite, diamond and graphite. Rock as construction material. Raw materials used in iron and steel, cement, refractories, fertilizer industries. Coal: its origin, chemical, macroscopic and microscopic constituents, ranks, classification, grade and utilization. Distribution of coal in India. Petroleum and natural gas deposits with special reference to their origin, migration and accumulation. Distribution of petroleum and natural gas in India. Methods of mineral prospecting (geological, geophysical and geochemical), mineral beneficiation and ore dressing.
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.
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.
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.
MANAGEMENT :	
Paper – I :	UNIT I EVOLUTION AND GROWTH OF MANAGEMENT THOUGHT Concepts, Theory and Practice, The Evolution of Management Thought -- Scientific Management School, The Operational or Management Process approach, Behavioural School, Contemporary School, Recent Contributions, Patterns of Management Analysis, Managerial Roles approach UNIT II PLANNING AND ORGANISING Planning –Nature, Importance, Types, Process, Concept of MBO, Objectives, Policies, Procedures, Strategies Decision-Making-Approaches, Decision-Making under Certainty, Risk and Uncertainty, Group Decision Making Guidelines The Nature of Organising -Types of Organisations, Organisational Levels, Process of Organising, Line/Staff Authority, Decentralisation of Authority and Delegation of Authority UNIT III DIRECTING, COORDINATING AND CONTROLLING Direction -- Supervision - Span of Management – Factors determining Span Motivation -- Elements - Importance – Methods - Morale Leadership--Theories, Approaches-Power and Authority Coordination - Definition - Characteristics- Objectives - Principles – Techniques Controlling --Control Process, Requirements for effective Control, Critical Control Standards and Techniques, Maintenance *vs.* Crisis Management, Overall Control Process UNIT IV ORGANISATIONAL BEHAVIOUR Foundations of Individual Behaviour-- Personality, Perception, Learning, Attitudes & values Foundations of Group Behaviour--Group Process, Group Tasks, Types, Group Development Conflict Management – Management of Change UNIT V RECENT DEVELOPMENTS Global Management, Managerial Functions in International Business, Business Process Reengineering, TQM-Six Sigma, Information Technology in Management, Enterprise Resource Planning (ERP); Supply Chain Management, Management of Innovation
Paper – II :	MARKETING MANAGEMENT Marketing Concept; Marketing Environment; Marketing Mix--4Ps *vs* 4Cs; Consumer Behaviour--Buying Process, Segmentation, Targeting, Positioning; Product—Types, Product Life Cycle; Pricing—Methods; Distribution—Channels; Promotion—Integrated Marketing Communications; Retailing—Recent Trends; Service Marketing—Features 7Ps; International Marketing—Cultural Dimension; Modes of Entry; e-marketing FINANCIAL MANAGEMENT Objectives; Functions; Sources of Finance; Working Capital Management; Cost of Capital; Operating and Financial Leverage; Dividend Policies; Capital Budgeting; Financial Control

	HUMAN RESOURCE MANAGEMENT Importance; difference between Personnel Management and HRM; Role of a HR Manager Human Resources Planning-Objectives-Importance-Process- Manpower Estimation-Job analysis-Job Description-Job Specification Recruitment-Sources of Recruitment-Selection Process-Placement and Induction Retention of Employees; Training and Development- Objectives and Needs-Training Process-Methods of Training-Tools and Aids-Evaluation of Training Programmes Performance Management System-Definition, Concepts, Different methods of Performance Appraisal Grievance Redressal—Concepts. Mechanisms Productivity Management—Concepts, Employee Involvement, Quality Circles, Kaizen Industrial Relations--Collective Bargaining-Settlement of Disputes STRATEGIC MANAGEMENT Concept, SWOT Analysis, PEST Analysis, Porter's 5 Forces Framework, BCG Matrix, GE Model; Values and Ethics; Corporate Governance; e-governance QUANTITATIVE TECHNIQUES Assignment; Transportation; Linear Programming (Graphical and Simplex methods); Network Analysis—PERT and CPM
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.

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.
PHILOSOPHY :	
Paper – I :	<u>Problems of Philosophy (European and Indian)</u> 1. Plato and Aristotle : Ideas, Substance; Form and Matter; Causation; Actuality and Potentiality. 2. Rationalism (Descartes, Spinoza, Leibnitz) : Cartesian Method and Certain Knowledge; Substance; God; Determinism and Freedom. 3. Empiricism (Locke, Berkeley, Hume) : Theory of Knowledge; Substance and Qualities; Self and God; Scepticism. 4. Kant : Possibility of Synthetic a priori judgments; Space and Time; Categories. 5. Moore, Russell and Early Wittgenstein : Defence of Common sense; Refutation of Idealism; Logical Atomism; Picture Theory of Meaning. 6. Logical Positivism : Verification Theory of Meaning; Rejection of Metaphysics. 7. Cârvâka : Theory of Knowledge; Metaphysics and Ethics. 8. Jainism : Anekântavâda,; Saptabhanginaya. 9. Buddhism : Four Noble Truths; Pratîtyasamutpâda, Kşaṇikavâda, Nairâtmyavâda. 10. Nyâya – Vaiśesika : Theory of Categories; Theory of Pramâna; Self; Theory of Causation; Atomistic Theory of Creation. 11. Sâmkhya : Prakṛti; Puruşa; Causation; Theory of Evolution. 12. Yoga : Citta; Cittavṛtti. 13. Mîmâmsâ : Epistemology; Theory of Validity. 14. Vedânta : Views of Śamkara and Râmânuja on Brahman; Îśvara; Âtman; Jîva; Jagat; Mâyâ; Avidyâ; Adhyâsa. 15. Swâmi Vivekânanda : Practical Vedânta. 16. Sri Aurobindo : Evolution; Involution; Integral Yoga. 17. Rabindranath Tagore: Nature of Man; Surplus in Man.
Paper – II :	<u>Socio – Political Philosophy and Psychology</u> 1. Social and Political Ideals : Equality, Justice, Liberty: Views of Mill, Locke, Rawls. 2. Individual and State : Rights, Duties and Accountability. 3. Political Ideologies : Anarchism, Marxism, Socialism and Democracy. 4. Humanism; Secularism; Multiculturalism. 5. Social Change : Gandhi, Ambedkar. 6. Mind – Body Problem : Dualism, Philosophical Behaviourism, Person Theory of Strawson. 7. Levels of Mind; Proofs for the existence of the unconscious; Freud's theory of dream, citta, cittavṛtti (Yoga). <u>Ethics and Philosophy of Religion</u> 8. Standards of Morality : Utilitarianism (Bentham and Mill), Deontological Theories. 9. Virtue Ethics : Aristotle. 10. Human Rights and Discrimination. 11. Feminism : Liberal and Radical. 12. Environmental Ethics : Bio-centric ethics and Eco-centric ethics. 13. Theories of Punishment; Capital Punishment. 14. Terrorism and Just war. 15. Indian Ethics : Puruşârtha, Concept of Liberation, Anuvrata and Mahâvrata (Jainism), Brahmavihâra (Buddhism). 16. Proofs for the existence of God : Descartes, St. Anselm, Naiyâyikas. 17. Religion without God, Religion and Morality. 18. Religious Pluralism. 19. Nature of Religious Language : Cognitive and Non-cognitive, Analogical and Symbolic.
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.
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.
POLITICAL SCIENCE :	
Paper – I :	<u>Group – A :</u> 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.
PSYCHOLOGY :	
Paper – I :	Basic psychological processes and development 1. Scope and Methods of Psychology - Biological basis of behaviour 2. Cognitive Processes: A) Sensation: attributes of sensation, psychophysics (weber-Fechner Law), Methods of Pscychophysics B) Attention: determinants of attention, fluctuation of attention, selectivity of attention C) Perception: Movement, space, depth and time perception, perceptual organization, Gestalt View 3. Learning.: Conditions of Learning ➢ Theory of classical conditioning ➢ Theory of operant conditioning ➢ Trial and error theory ➢ Theory of insight learning ➢ Programmed learning 4. Memory: Encoding, storage, retrieval ➢ Types of Memory (STM & LTM, ICONIC, Echoic & Procedural) ➢ Forgetting curve ➢ Theories of forgetting 5. Motivation and Emotion: Physiological and psychological basis of motivation and emotion ➢ Intrinsic and extrinsic motivation - factors influencing intrinsic motivation ➢ Theories of motivation - Maslow, Mcclelland ➢ Theories of Emotion - James-Lange Theory, Canon-Bard and Schachter-Singer Theory ➢ Effects of Motivation and emotion on behaviour 6. Intelligence ➢ Spearman's two factor theory ➢ Thurstone' s theory ➢ Guilford's structure of intellect ➢ Gardner's theory ➢ Measurement of intelligence - IQ & deviation IQ, Tests of intelligence - Stanford Binet ➢ Types of intelligence - Social, abstract, concrete, emotional, artificial, spiritual ➢ Gifted and mentally challenged children

	7. Thinking ➢ Piaget's theory of cognitive development ~ Problem solving ➢ Creative thinking - Nature and stages 8. Attitude, Values and Interest ➢ Definition of attitude, values and interests ➢ Value - concept, development and measurement ➢ Attitude - formation, measurement and change concept ➢ Stereotype, prejudice, discrimination ➢ Measurement, reduction of prejudice 9. Interest - concept and measurement 10. Development of behaviour : From birth to adolescence ➢ Physical development ➢ Emotional development ➢ Moral development ➢ Social development
Paper – II :	1. Personality ➢ Theories of personality - Freud, Erikson, Eysenck and Rogers 2. Individual Difference: Nature - Nurture controversy ➢ Nature - nurture controversy ➢ Character and construction of standardized psychological tests, types of tests 3. Mental health & adjustment - concept of mental health & wellbeing ➢ Stress & health - nature, types, causes and consequence of stress ➢ Adjustment - criteria of adjustment ➢ Management of stress 4. Psychological Disorders ➢ Causes of abnormal behaviour ➢ Anxiety disorders ➢ Mood disorders ➢ Schizophrenia ➢ Substance abuse disorders 5 .. Psychotherapy ➢ Psychoanalysis ➢ Cognitive Behaviour therapy ➢ Client centered therapy 6. Organizational psychology ➢ Personal selection, job analysis methods ➢ Job Satisfaction ➢ Theories of motivation, Herzberg, Alderfer ➢ Conflict in organization - sources, types ➢ Organizational culture and climate ➢ Occupational health hazards 7. Group ➢ Types of group ➢ Group versus team - Influence of primary and secondary group on society ➢ Structure and functions of group ➢ Leadership - Characteristics of a good leader with special reference to trans actual and transformational leadership 8. Social problems ➢ Problems of social integration caste, class and religion ➢ Delinquency and crime ➢ Psychosocial problems related to old age 9. Application of Psychology to different fields a) Rehabilitation - concept, primary, secondary and tertiary prevention b) Education - Psychology, principles underlying effective teaching-learning c) Motivating and training people for entrepreneurship and economic development

	10. Psychology and Methodology ➢ Normal probability curve ➢ Parametric and non-parametric statistics - characteristics ➢ Hypothesis formation ➢ Research variables and their control ➢ Techniques of sampling
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.
STATISTICS :	
Paper – I :	Probability theory: Definition of probability: Classical and relative-frequency approach to probability, Kolmogorov's Axiomatic definition (detailed discussion on discrete space only), limitations of Classical definition. Probability of union and intersection of events, Conditional probability and Independence of events, Bayes' Theorem and its applications Random Variables : Definition of discrete and continuous random variables, cumulative distribution function (c.d.f.) and its properties (with proof), probability mass function (p.m.f.) and probability density function (p.d.f.), Expectation and Moments, Joint distribution of two random variables, marginal and conditional distributions, Statistical Independence. Convergence in Probability, Weak Law of Large Numbers and its applications, Convergence in Distribution, Chebyshev's inequality, Statement of Central Limit Theorem (i.i.d. case) & its applications. Statistical Inference: Point & Interval Estimations and Testing of Hypothesis: Point estimation: Requirements of a good estimator – notions of Mean Square Error, Consistency,

	Unbiasedness: Minimum Variance Unbiasedness and Best Linear Unbiasedness. Sufficiency and factorization theorem, Rao-Balckwellisation, Methods of estimation- moments, least square, maximum likelihood and minimum chi-square Elements of Hypothesis Testing : Null and Alternative hypotheses, Simple and Composite hypotheses, Critical Region, Type I and Type II Errors, Level of Significance and Size, p-value, Power. MP and UMP tests, Neyman Pearson lemma, Likelihood ratio tests. Interval Estimation: Confidence intervals, Concepts of Uniformly Most Accurate (UMA) confidence sets, relationship with tests of hypotheses. Multivariate Analysis: Multivariate data – multiple regression, multiple correlation and partial correlation – their properties and related results. Random Vector: Probability mass and density functions, Distribution Function, Mean vector and Dispersion matrix, Marginal and Conditional Distributions, Ellipsoid of Concentration, Multiple Regression, Multiple Correlation, Partial Correlation, Multonomial and Multivariate Normal Distributions. Sample Survey: Concepts of a Finite Population and a Sample, Need for Sampling, Complete Enumeration and Sample Surveys. General Ideas: Planning and execution of sample surveys, analysis of data and reporting, Biases and Errors. Judgement and probability sampling. Tables of Random Numbers and their uses Simple Random Sampling with and without replacement, Determination of sample size in simple random sampling, Stratified random sampling, Systematic sampling, Cluster and multistage sampling, ratio and regression methods of estimation. Analysis of variance and Design of Experiments: Heterogeneity and Analysis of Variance and Covariance, Linear Hypothesis, Orthogonal splitting of total variation, applications of the ANOVA technique to: one-way classified data, two-way classified data with equal number of observations per cell (fixed effects model only). Principles of experimental design: Randomization, Replication and Local Control, Uniformity trials, Shapes and Sizes of Plots and Blocks. Standard Designs and their Analyses: Completely Randomized Design (CRD), Randomized Block Design (RBD) and Latin Square Design. Factorial Designs- 2^2 and 2^3 experiments.
Paper – II :	Industrial Statistics: Introduction: Concepts of Quality and Quality Control, Process Control and Product Control. Process Control: Control Charts and their uses, Choice of Subgroup sizes, Construction of control charts by attributes (p, c, np) (including unequal subgroup size) and variables ($\bar{X}$, R). Interpretation of non-random patterns of points. Product Control: Producer's Risk, Consumer's Risk, Acceptance Sampling Plan, Single and Double sampling plans by attributes, their OC, ASN (and ATI), LTPD and AOQL , Sequential sampling plan- OC and ASN. Concept of Reliability, failure rate and reliability functions, reliability of series and parallel systems. Economic Statistics: Index Numbers: Price, Quantity and Value indices. Price Index Numbers: Construction, Uses, Limitations, Tests for index numbers,Various formulae and their comparisons, Chain Index Number. Some Important Indices: Consumer Price Index, Wholesale Price Index and Index of Industrial Production – methods of construction and uses. Measurement of income inequality: Gini's coefficient, Lorenz curves, Application of Pareto and Lognormal as income distributions. Population Statistics: Introduction: Sources of Population Data – Census data, Registration data and the errors in such data. Rates and ratios of vital events. Measurements of Mortality: Crude Death rate, Specific Death Rate, Standardized death Rate, Case fatality rate and Cause of Death Rate, Infant Mortality Rate, Neonatal and Perinatal Mortality Rates. Life tables: Descriptions of Complete and Abridged Life Tables and their uses, Cohort vs. Current Life Tables, Stable population and Stationary population, Construction of complete life table from population and death statistics.

Measurements of Fertility: Crude Birth Rate, General Fertility Rate, Age Specific Fertility Rate, Total Fertility Rate. Growth Curve models.

Time Series Analysis:
Introduction: Examples of time series from various fields, Components of a times series, Additive and Multiplicative models.
Trend and Seasonal Components: Estimation of trend by linear filtering (simple and weighted moving-averages) and curve fitting (polynomial, exponential), Estimation of seasonal component by ratio to moving-average method, ratio to trend method, some special processes-: Moving Average process, Auto Regressive processes of orders one and two, Exponential smoothing method of forecasting.

Linear Programming: Formulation of LP problems, Simple LP model and its graphical solution, Simplex algorithm.

Official statistics:
The Statistical system in India: The Central and State Government organizations, the functions of the Central Statistical Organization (CSO), National Sample Survey Organization (NSSO) and West Bengal Bureau of Applied Economics and Statistics.

National Income statistics: Income, expenditure and production approaches. Their applications in various sectors in India

ZOOLOGY :

Paper – I :

Group A : Short/objective questions.
This group will cover the whole content of the Paper (I)

Group B : <u>Non-Chordata & Chordata</u>

01. Outline classifications of Protozoa upto Phyla
02. Outline classifications of Porifera to Hemichordata upto classes.
03. Classification of chordata upto orders.

Non Chordata Locomotion in Protozoa Annelida, Insecta & Mollusca,
Excretion and Osmoregulation in Annelida, Arthropoda & Mollusca.
Sense organs in Mollusca and Arthropoda.

<u>Specialized Features:</u>
Conjugation in ciliates
Polymorphism in Siphonophora
Coral reefs: types and formation
Evolutionary position of Onychophora, Limulus
Social Organisation in insects – Honey bee & Termites

Chordata <u>Specialized Features:</u>
Ciliary mode of feeding in lower chordates.
Integumentary derivatives in mammals.
Comparative anatomy of heart, aortic arches & Kidney
Respiratory structure and function in fish, bird and mammals.
Ruminant stomach.
Evolutionary position of Sphenodon and Monotremata
Poison apparatus, Biting mechanism and types of poison in snakes.
Retrogressive metamorphosis, Neoteny and paedogenesis.
Migration of Birds
Aerodynamics in birds flight.
Echolocation in Chiroptera and Caetacea

Group C : Ecology, Biodiversity and Ethology
Energy flow, Population Dynamics — Growth forms, mortality, natality, population density regulation.
Niche concept and resource Partitioning
Ecological succession.

Pollution : Green house effect, Pollutants types and nature. Acute and chronic toxicity due to air and water pollution.

Innate and learned behaviour, FAP (Fixed Action Plan), Selfishness, Co-operation, Altruism and Kinship

Biodiversity : Definition, Levels, values, in-situ and Ex-situ conservation, Hot spots, megadiversity

	countries, Biopiracy. Wildlife management strategies with reference to Tiger, Rhino and Elephant, Elementary concept on remote sensing for sustainable diversity. Systematics and Quantitative Biology Codes of Zoological nomenclature, species concept, phenetics and cladistics. Measure of Central Tendency, Probability, Student t test Chi square, ANOVA, Goodness of fit.
Paper – II :	Group A : Short/objective questions. This group will cover the whole content of the Paper (II) Group B : Cell Biology & Genetics : Ultra structure & functioning of – Plasmamembrane, Golgi complex, Mitochondria, ER, Lysosome, Chromosome, Nucleosome, Cell cycle. Allele : Types, ABO blood group, Bombay phenotype, 3 point chromosome mapping in diploid with problems. Autosomal & sex linked inheritance in Drosophila & Man, Sex determinations in Drosophila & Man. Replication, Transcription and m RNA processing & Translation in prokaryots. Operon concept – Lac & Tryptophan, Mutations & Mutagenesis, Down, Klinefelter and Turner syndrome, Albinisim, Sickle cell anaemia, Thalassemia, Recombinant DNA : Vector, Principle of cloning, Restriction Endonucleases Transgenic animals. Role of protooncogene & Tumor Supressor Genes. Human Genome Project. Histology & Endocrinology : <u>Histology</u> : Cell types and functions. Pituitary, endocrine pancreas, gonads, Thyroid, adrenal. Mechanism of hormone action, Basic concept of cell signalling. Hormonal control of reproductive cycles in mammals. General idea of insect endocrine glands and their function. <u>Physiology & Biochemistry</u> : Enzymes : Classes, kinetics and factors affecting enzyme action. Osmoregulation : Types and mechanism in aquatic vertebrates. Macromolecules : Protein, fat & carbohydrates. Glycolysis, pentose phosphate pathway, Transamination & oxidative and non-oxidative deamination. Role of haemoglobin in oxygen & carbon di oxide transport, Foetal haemoglobin, Physiology of nerve impulse and propagation, Muscular contraction, Vitamines. Principles and use of instruments – Spectrophotometer, TLC, RAPD, RFLP, PCR, ELISA , DNA finger printing. <u>Group C</u> : Developmental Biology Gametogenesis, fertilization, IVF basic concept, cleavage-types and examples. Gastrulation in frog and chick. Organizer, induction and competence. Placenta : Types and formation. Organogenesis : Eye and heart. Evolution & adaptation : Origin of life, natural selection : modern view, Neutral theory. Evolution : Elephant, Horse & Man. Hardy Weinberg equilibrium and factors affecting it. Fossilization, Zoogeographical realms, continental drift, Adaptive features of Aquatic, Volant and desert animals. Mimicry and colouration. Economic Zoology : Pisciculture, Apiculture, Sericulture & Poultry. Types of cattle breed in India. Common pests of paddy, wheat and jute – damage & control, IPM Parasitology & Immunology : Morphology, Life-cycle, Pathogenecity and control of *Plasmodium, Leishmania, Taenia, Fasciola, Ancylostoma* & *Wuchereria.* Immunoglobulin classification, T & B cell cooperation. T cell receptors, cytokines, complements. Antigen-antibody reaction. Principles and importance of vaccination. Pathophysiology of Tuberculosis, Types of virus.

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