

FEDERAL PUBLIC SERVICE COMMISSION
(Curriculum & Research Wing)

Schemes and Syllabi for Screening/Professional Tests as well as Descriptive Examination
Relating to Posts Advertised under Consolidated Advertisement No. 01/2022

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
1.	01/2022	Assistant Private Secretary (BS-16) in different Ministries/ Divisions/ Department	i. Second Class or Grade 'C' Bachelor's degree from a University recognized by HEC. ii. Minimum shorthand speed: 100 w.p.m. and typing speed: 50 w.p.m. iii. Must be computer literate.	<ul style="list-style-type: none"> • Typing Test with minimum Speed of 50 W.P.M • Shorthand Test with minimum Speed of 100 W.P.M • Computer Literacy Test: <ul style="list-style-type: none"> i Microsoft Word (Typing, Formatting) ii Microsoft Excel (Typing, Graph, Calculations) iii Microsoft Power Point (Typing, Formatting, Inserting Objects) 	35 Marks 35 Marks 10 Marks 10 Marks 10 Marks
2.	02/2022	Assistant Private Secretary (BS-16), National Accountability Bureau.	i. Second Class or Grade 'C' Bachelor's degree (14-years education) from HEC recognized Institution. ii. Minimum shorthand speed: 100 w.p.m. and typing speed: 50 w.p.m. iii. Certification in Computer operations. NOTE: (i) Computer literacy means proficiency in M.S Office (M.S Word, Power Point & Excel). (ii) The Services of selected candidates shall be governed under NAB Employees Terms and Conditions of Services (TCS)-2002 and MAQ-2015 as amended from time to time by NAB.	<ul style="list-style-type: none"> • Typing Test with minimum Speed of 50 W.P.M • Shorthand Test with minimum Speed of 100 W.P.M • Computer Literacy Test: <ul style="list-style-type: none"> i Microsoft Word (Typing, Formatting) ii Microsoft Excel (Typing, Graph, Calculations) iii Microsoft Power Point (Typing, Formatting, Inserting Objects) 	35 Marks 35 Marks 10 Marks 10 Marks 10 Marks

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
3.	03/2022	Junior Librarian (BS-16), National Library of Pakistan, National Heritage & Culture Division.	Second Class or Grade 'C' Master's degree in Library Science or Library and Information Science or equivalent qualification from a University recognized by HEC. OR i. Second Class or Grade 'C' Bachelor's degree in Library Science or equivalent qualification from a University recognized by HEC. ii. Two (2) years post qualification experience in the relevant field.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Grammar Usage, Sentence Structuring Part-II 1 Introduction to Library & Information Science 2 Information Sources and Services 3 Classification: Theory and Practice 4 Cataloguing: Theory and Practice 5 Collection, maintenance and issuance of library books. 6 Library Automation/Information Storage & Retrieval 7 Research Methods & Techniques for Librarians 8 Public Records, Rare Material & their Conservation 9 Management of Serials Publications 10 Rules & Procedure for Write off of library material
4.	05/2022	Medical Officer (BS-17), Airports Security Force, Cabinet Secretariat (Aviation Division).	MBBS.	Objective Type Test (MCQ) Part-I English =20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II 1 Core courses of MBBS Degree Program. 2 Health Policies of the Government of Pakistan. 3 Care vs Cure for Health Management. 4 Major Challenges being faced by the Health Sector in Pakistan.
5.	06/2022	Assistant Director (BS-17), Airports Security Force, Cabinet Secretariat (Aviation Division).	Second Class or Grade 'C' Master's/ Bachelor's (16 years) degree or equivalent qualification from a University recognized by HEC. Physical Standard of Fitness (i) Minimum Height: For male 5'-6" or 168 cm and for female 5'-2" or 157 cm. (ii) Minimum Weight: For male 106 Lbs or 48.1 Kg and for female 45 Kg or 99.2 Lbs. (iii) Minimum Chest Measurement: For male 32 ³ / ₄ " or 83 cm, Expanded 34 ³ / ₄ " or 88 cm.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II General Intelligence/ Professional Test = 80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II 1 Basic Arithmetic – Algebra – Ratios – Percentages – Arithmetic Means 2 Current Affairs. – Issues/Challenges at National and International Level during the last 2 years 3 Pakistan Affairs & Islamic Studies – Basic Level knowledge 4 Security Measures to Maintain Law & Order

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
6.	07/2022	Inspector (BS-16), Airports Security Force, Cabinet Secretariat, (Aviation Division).	Bachelor's Degree. Physical Standard of Fitness (i) Minimum Height: For male 5'-6" or 168 cm and for female 5'-2" or 157 cm. (ii) Minimum Weight: For male 106 Lbs or 48.1 Kg and for female 45 Kg or 99.2 Lbs. (iii) Minimum Chest Measurement: For male 32¾" or 83 cm, Expanded 34¾" or 88 cm.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II General Intelligence/ Professional Test = 80 marks	Part-I Grammar Usage, Sentence Structuring. Part-II 1 Basic Arithmetic – Algebra – Ratios – Percentages – Arithmetic Means 2 Current Affairs. – Issues/Challenges at National and International Level during the last 2 years 3 Pakistan Affairs & Islamic Studies – Basic Level knowledge 4 Security Measures to Maintain Law & Order
7.	10/2022	Assistant Executive Engineer (B&R/ E&M) (BS-17) (A) Civil Engineering (B) Town Planning Engineering (C) Architect Engineering (D) Electrical Engineering (E) Mechanical Engineering M.E.S, Ministry of Defence.	Bachelor's Degree in Civil/ Electrical/ Mechanical/ Architecture/ Town Planning Engineering from a recognized University.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	For (A) Civil Engineering Part-I Vocabulary, Grammar Usage, Sentence Structuring. Part-II 1 Soil Mechanics & Foundation Engineering 2 Hydraulic & Hydrology 3 Surveying & Levelling 4 Construction Management 5 Building Material & Building Construction 6 Structural Design Applications 7 Engineering Materials 8 Concrete Technology & R.C.C Structure Design 9 Reinforced Concrete 10 Sewage Treatment 11 Preparation of Technical/ Project Proposal 12 PC-1 for Building and Infrastructure Projects 13 Project Management & Supervision 14 Contract Management. 15 Basic IT/Computer Knowledge 16 Costing and Estimation 17 Water Resources and Water Supply Design 18 Steel Structure, Design and Analysis 19 Environmental Engineering

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
					<p><u>For (B) Town Planning Engineering</u></p> <p><u>Part-I</u> Vocabulary, Grammar Usage, Sentence Structuring.</p> <p><u>Part-II</u></p> <ol style="list-style-type: none"> 1 Planning Surveys, 2 Planning Theories, 3 Auto-Cad, 4 Environmental Planning, 5 Socio-Economic Aspects of Planning, 6 Transportation Planning, 7 Environmental Engineering, 8 Regional Planning, 9 Building & Development Control, 10 City Planning, 11 Development Planning in Pakistan. 12 Planning Techniques 13 Urban Growth Boundaries 14 Urban Housing 15 Sustainable Development 16 MS Office 17 Project Management <p><u>For (C) Architecture Engineering</u></p> <p><u>Part-I</u> Vocabulary, Grammar Usage, Sentence Structure.</p> <p><u>Part-II</u></p> <ol style="list-style-type: none"> 1 Building Materials, 2 Surveying, 3 Estimation and Quantity Surveying, 4 Environmental Control Systems, 5 Environmental Engineering, 6 Plumbing Design, 7 Architectural Design, 8 Theory of Structures, 9 Soil Mechanics, 10 Construction Management, 11 Project Scheduling, 12 Building Standards, 13 Auto-Cad. 14 3D Max 15 MS Office 16 Project Management

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
					<p><u>For (D) Electrical Engineering</u></p> <p><u>Part-I</u> Vocabulary, Grammar Usage, Sentence Structuring.</p> <p><u>Part-II</u></p> <ol style="list-style-type: none"> 1 Electric Circuits 2 Semiconductor Devices 3 Electrical Instrumentation 4 Power Transmission 5 Power System Operation and Control 6 Power System Protection 7 Electrostatics & Electronic System Design 8 DC Motors & Generators 9 Transmission Lines & Antennas 10 Basic IT/Computer Knowledge 11 DC Generators and Batteries 12 Power Factor and Power Factor Improvement 13 AC Fundamentals 14 AC Motors and AC Generators 15 Power System Analysis 16 Heating Ventilation and AC Equipment 17 Project Management <p><u>For (E) Mechanical Engineering</u></p> <p><u>Part-I</u> Vocabulary, Grammar Usage, Sentence Structuring.</p> <p><u>Part-II</u></p> <ol style="list-style-type: none"> 1 Heat Transfer 2 Thermodynamics 3 Industrial Materials 4 Machine Design and Drawing 5 Mechanics of Machines 6 Production Management & Quality Control 7 Workshop Technology 8 Hydraulic Machines 9 Basic IT/Computer Knowledge 10 Heating Ventilation and AC Equipment (in depth knowledge) 11 Project Management

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
8.	11/2022	Store Officer (BS-16), M.E.S, Ministry of Defence (Defence Division).	i. Bachelor's degree in Commerce. ii. Three (3) years post qualification experience of store handling / management.	Objective Type Test (MCQ) Part-I English =20 marks Part-II Professional Test=80 marks	Part-I Grammar usage, Sentence Structuring Part-II 1 Procedures for Receipt and Issue of Stores 2 Stores procedures with relation to following topics:- a. Stock Taking b. Care and Preservation of Military/ Engineering Stores 3 Ware House Management 4 Legal & Financial Arrangement 5 Stock Management 6 Preparation of Tender Documents 7 Public Procurement (PPRA) Rules, 2004 8 Maintenance & Safety Inspections 9 Basic Knowledge of IT/Computer
9.	12/2022	Assistant Programmer (BS-17), M.E.S, Ministry of Defence (Defence Division).	Master's Degree in Computer Science. OR Bachelor's Degree in Civil Engineering with diploma or approved course in Computer Science with three (3) years post qualification experience in Computer Programming.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test = 80 marks	Part-I Vocabulary, Grammar usage, Sentence Structuring. Part-II 1 Program Logic, 2 Visual Basic, C++, Java, JQUERY, Unix/Red Hat Linux Operating System, 3 Computer Networks and Internet, 4 Development of Basic Algorithms, 5 Designing Solution & Testing, 6 Data types, 7 Multiple Browsers, 8 Search Engine Optimization, 9 Hyper Text Markup Language (HTML), 10 Web Development
10.	14/2022	Medical Officer (BS-17), Federal Government Polyclinic, Ministry of National Health Services, Regulations & Coordination.	i. MBBS or equivalent qualification recognized by PMC. ii. One (1) year House Job.	Objective Type Test (MCQ) Part-I English =20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II 1 Core courses of MBBS Degree Program. 2 Health Policies of the Government of Pakistan. 3 Care vs Cure for Health Management. 4 Major Challenges being faced by the Health Sector in Pakistan.

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
11.	15/2022	Inspector Customs/ Intelligence Officer (BS-16), Revenue Division, Federal Board of Revenue.	<p>i. Second Class or Grade 'C' Bachelor's degree from a recognized University with Economics, Commerce, Statistics, Accounting, Computer Science, Law, Pharmacy, Chemistry or Physics as one of the subjects or B.Sc. Engineering in any specialty.</p> <p>ii. Computer literacy up to the level of MS Word, MS Power Point and MS Excel.</p>	<p>Objective Type Test (MCQ)</p> <p>Part-I English = 20 marks</p> <p>Part-II General Intelligence=80 marks</p>	<p>Part-I Grammar Usage, Sentence Structuring.</p> <p>Part-II</p> <ol style="list-style-type: none"> 1 Basic Arithmetic <ul style="list-style-type: none"> - Algebra - Ratios - Percentages - Arithmetic Means 2 Current Affairs. <ul style="list-style-type: none"> - Issues/Challenges at National and International Level during the last 2 years 3 Pakistan Affairs & Islamic Studies <ul style="list-style-type: none"> - Basic Level knowledge 4 Basic Computer Operation in MS Office <p>Note: For Pre-selected candidate, syllabus for Descriptive Test is at Page-10 below</p>
12.	20/2022	Appraising/ Valuation Officer (BS-16), Revenue Division, Federal Board of Revenue.	<p>i. Second Class or Grade 'C' Bachelor's degree from a recognized University with Economics, Commerce, Statistics, Accounting, Computer Science, Law, Pharmacy, Chemistry or Physics as one of the subjects or B.Sc. Engineering in any specialty.</p> <p>ii. Computer literacy up to the level of MS Word, MS Power Point and MS Excel.</p>	<p>Objective Type Test (MCQ)</p> <p>Part-I English = 20 marks</p> <p>Part-II General Intelligence Test = 80 marks</p>	<p>Part-I Grammar Usage, Sentence Structuring.</p> <p>Part-II</p> <ol style="list-style-type: none"> 1 Basic Arithmetic <ul style="list-style-type: none"> - Algebra - Ratios - Percentages - Arithmetic Means 2 Current Affairs. <ul style="list-style-type: none"> - Issues/Challenges at National and International Level during the last 2 years 3 Pakistan Affairs & Islamic Studies <ul style="list-style-type: none"> - Basic Level knowledge 4 Basic Computer Operation in MS Office <p>Note: For Pre-selected candidate, syllabus for Descriptive Test is at Page-10 below</p>

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
13.	22/2022	Research Officer (BS-17), Transport & Communication Section, Ministry of Planning, Development and Special Initiatives.	i. Bachelor's degree or equivalent qualifications in Civil Engineering or Electrical Engineering. ii. PEC registration.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar usage, Sentence Structuring Part-II (For Civil Engineers) 1 Soil Mechanics & Foundation Engineering 2 Hydraulic & Hydrology 3 Surveying & Levelling 4 Construction Management 5 Building Material & Building Construction 6 Structural Design Applications 7 Engineering Materials 8 Concrete Technology & R.C.C Structure Design 9 Reinforced Concrete 10 Sewage Treatment 11 Water Resources and Water Supply Design 12 Steel Structure, Design and Analysis 13 Environmental Engineering 14 Principles of Planning 15 Research and Analysis 16 Report Writing 17 Presentation Skills 18 Public Procurement (PPRA) Rules, 2004 Part-I Vocabulary, Grammar usage, Sentence Structure Part-II (For Electrical Engineers) 1 Power & Digital Electronics, 2 Electronic Devices and Structure, 3 Calibration of Test Measuring Diagnostic Equipment, 4 Electric Circuits, 5 Semiconductor Devices, 6 Electronic/ Electrical Instrumentation, 7 Oscillators & Circuit Theory, 8 Rules and Instructions of Repairs of the Multilayer Printed Circuit Boards, 9 Use of Specialized Diagnostic Test Equipment, 10 Handling of Programmable ICs, 11 PCBs Designing Software, 12 Principles of Planning 13 Research and Analysis 14 Report Writing 15 Presentation Skills 16 Public Procurement (PPRA) Rules, 2004

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
14.	24/2022	Research Officer (BS-17), Public Administration Section, Ministry of Planning, Development and Special Initiatives.	Second Class or Grade 'C' Master's degree or equivalent in Political Science/ Public Administration or Business Administration.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II 1 Public Administration 2 Principles of Management 3 Human Resource Management 4 Financial Accounting 5 Rules of Business (as amended) 6 System of Financial Control and Budgeting 2006 7 Research and Analysis 8 Report Writing 9 Presentation Skills 10 Public Procurement Rules, 2004

Syllabus for Descriptive Test of

F.4-15/2022-R (Inspector Customs/ Intelligence Officer) & F.4-20/2022 (Appraising/ Valuation Officer)

Max Marks: 100

Qualifying Standard 40%

Time Allowed: 3 Hours

Part-I (English Essay): 40 Marks

Candidates will be required to write an Essay in English comprising **1000 words** from a set of **four given topics**. Candidates are expected to reflect comprehensive knowledge on a selected topic. Candidate's articulation, expression and technical approach to the style of English Essay writing will be examined.

Part-II (Current Affairs): 30 Marks

Candidates will be expected to demonstrate knowledge on current affairs related to the following:

- CPEC and Pakistan,
- Kashmir Issue,
- Pak US relations
- Afghanistan Crisis

Part-III (Islamic Studies/Pakistan Studies): 30 Marks

I. Islamic Studies

Introduction to Islam, Seerah of the Prophet Muhammad (PBUH) as Role Model, Status of Woman in Islam, Articles of Faith, Islamic Code of Life, Islamic Concept of Human Rights

II. Pakistan Studies

Parliamentary democracy in Pakistan under 1973 Constitution, Salient features of the Constitution of Pakistan 1973, Economic Challenges for Pakistan, Major social problems of Pakistan.

SUGGESTED READINGS

S.No.	Title	Author
1.	Pakistan and World Affairs	Shamshad Ahmad (Edition-2015)
2.	Constitution of Pakistan 1973	
3.	Kashmir in Conflict: India, Pakistan and the Unending War.	Schofield, Victoria. New York: I.B.Tauria, 2003.
4.	Modern South Asia: History, Culture, Political Economy.	Jalal, Aisha and Bose, Sugata. New York: Routledge, 1998.
5.	Federalism and Ethnic Conflict Regulation in India and Pakistan.	Adeney, Katharine. , New York: Palgrave Macmillan, 2007.
6.	Pakistan's Energy Sector: From Crisis to Crisis-Breaking the Chain	Zaid Alahdad
For Islamic Studies		
7.	Introduction to Islam	Dr. Hamidullah
8.	Islam: its meaning and Message	Khurshid Ahmad
9.	Insan e Kamil	Dr Khalid Alvi
10.	Islami Tehzeeb Kay Chund Darakhshan Pehloo	Mustafa Sabali

**Schemes and Syllabi for Written Examination (Descriptive) for Posts in
BS-20 advertised under Consolidated Advertisement No. 01/2022**

Case No.	F.4-19/2022-R
Particulars of post	Chief (BS-20), Population & Social Planning Section, Ministry of Planning, Development and Special Initiatives.
Minimum Qualification & Experience:	<ul style="list-style-type: none"> i. Second Class or Grade 'C' Master's degree or equivalent qualifications in any of the following subjects: Economics with Statistics, Business Administration, Public Administration, Demography, Sociology, or social Work. ii. Fifteen (15) years post qualification experience of work and/or research relating to social welfare, population welfare, or demography or planning or development in these fields.

PAPER: PROFESSIONAL (100 MARKS)

Analysis Paper: Candidates will be required to analyse a situation related to advertised post and suggest/draw suitable solution comprising approximately **1000 words**. Candidate's research based knowledge as well as articulation, expression and technical treatment of the situation will be examined.

OR

Case Study: Candidates will be given real situation case studies related to advertised posts/ organization concerned and will be expected from the candidates to present (i) identification of issues (ii) evaluation of issues (iii) legal or case related theories (iv) evaluation of case facts if required and (v) possible solution of the case or writing judicial order, if the case so requires.

Schemes and Syllabi for Written Examination (Descriptive) for All Posts in BS-18 & BS-19 included in Consolidated Advertisement No. 01/2022

PAPER-I: ENGLISH

Max Marks: 100

Time Allowed: 3 Hours

- (i) **English Essay-50 Marks:** Candidates will be required to write an Essay in English comprising **1500 words** from a set of **six given topics**. Candidates are expected to reflect comprehensive and research based knowledge on a selected topic. Candidate's articulation, expression and technical approach to the style of English Essay writing will be examined.
- (ii) **English (Composition and Précis)-50 Marks:**
The examination will test the candidate's abilities to handle Précis Writing, Reading Comprehension, Sentence Structuring, Translation, Grammar and Vocabulary, etc.
- Précis Writing (10 marks):** A selected passage with an orientation of generic understanding and enough flexibility for compression shall be given for précising and suggesting an appropriate title.
- Reading Comprehension (10 marks):** A selected passage that is rich in substance but not very technical or discipline-specific shall be given, followed by five questions, each carrying 2 marks.
- Grammar and Vocabulary (10 marks):** Correct usage of Tense, Articles, Prepositions, Conjunctions, Punctuation, Phrasal Verbs, Synonyms and Antonyms etc.
- Sentence Correction (5 marks):** Ten sentences shall be given each having a clear structural flaw in terms of grammar or punctuation. The candidates shall be asked to rewrite them with really needed correction only, without marking unnecessary alterations. No two or more sentences should have exactly the same problem, and 2-3 sentences shall be based on correction of punctuation marks.
- Grouping of Words (5 marks):** A random list of ten words of moderate standard (neither very easy nor utterly unfamiliar) shall be given, to be grouped by the candidates in pairs of those having similar or opposite meaning, as may be clearly directed in the question.
- Pairs of Words (5 marks):** Five pairs shall be given of seemingly similar words with different meanings, generally confused in communication, for bringing out the difference in meaning of any five of them by first explaining them in parenthesis and then using them in sentences.
- Translation (5 marks):** Ten short Urdu sentences involving structural composition, significant terms and figurative/idiomatic expressions shall be given, to be accurately translated in English.

SUGGESTED READINGS

Sr. No.	Title	Author
1.	English Grammar in Use	Raymond Murphy (Cambridge University Press)
2.	Practical English Usage	M. Swan (Oxford University Press)
3.	The Little, Brown Handbook	H. Ramsey Flower & Jane Aaron (The Little, Brown & Co; Harper Collins)
4.	A University English Grammar	R. Quirk & S. Greenbaum (ELBS; Longmans)
5.	Write Better, Speak Better	Readers Digest Association
6.	Modern English in Action	Henry Christ (D.C. Heath & Co.)
7.	Exploring the World of English	Syed Saadat Ali Shah

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-04/2022-R
Particulars of post	Director (HRDC) (BS-19) , National Library of Pakistan, National Heritage & Culture Division.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's degree in Library Science or Library and Information Science or equivalent qualification from a University recognized by HEC. ii. Twelve (12) years post qualification experience in the relevant field.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

**Part-II: 75 Marks (Descriptive)
(Library/Information Science)****I. Information, Library and Society**

Nature of information and knowledge. Library and Information Profession, Library and its role in Society. Information society. Communication and information management. Social information. Economic aspects of information. Information policy. Freedom of information. Information privacy. Intellectual property. Information ethics.

II. Use of Emerging Technologies in Library

Information and other library technologies. Hardware. Software. Operating system. Telecommunications and networks. Internet and the WWW, barcode technology, wireless technology and virtual private network (VPN). Social networking. Email. Word processing. Spreadsheets. Presentation software. Desktop publishing. Databases. Library security systems. Tele-lifts. Digitization hardware and software. Reprographic technology.

III. Organization of Information

Historical development of the organization of information. Systems for organization of information: Environments, Storage and Retrieval tools, Encoding standards, Cataloguing Codes, Current systems. The information organization process: Surrogate/Metadata records: Description, Access; Authority control. Subject access: Analysis, Verbal subject approaches, Classification. Organization and administration: Arrangement, Management issues. Problems of information organization in Pakistan.

IV. Basic Reference Sources

Definition. Evaluation Criteria. Bibliographies-- General bibliographies, Basic guides to reference materials, Library catalogs; Serials guides; Indexes and abstracts; HEC NDL; Dictionaries and thesauri; Almanacs and fact books; Encyclopedias; Directories; Biographical sources; Geographical sources-- Maps, atlases & gazetteers; Reference Web sites; Internet Public Library (<http://www.ipl.org/div/subject/browse/ref00.00.00>). Evaluation

V. Management of Library and Information Services

Basic theories and principles of administration for effective management of public, academic, and special libraries and information centres, With emphasis on planning, organizing, staffing, directing, coordinating, reporting, and budgeting. Administrative aspects of public and technical services, facilities, rules and regulations, evaluation, public relations, inter-agency cooperation, and change management. Library space management.

VI. Research Methodology

Definition. Types of research. Research methods. Research problem. Theory formulation. Literature review. Research questions / hypotheses. Sampling. Data collection. Data analysis and Interpretation. Report writing. Dissemination of results. Research proposal. Research ethics. Research in library & information science.

SUGGESTED READINGS

S. No.	Title	Author
1.	Practical research methods for librarians and information professionals.	Beck, S. E., & Manuel, K. (2007).
2.	Reference and information services: An introduction.	Bopp, R. E., & Smith, L. C. (2001).
3.	Future Librarians: dreams, Madness & reality.	Crawford, W and Gorman, Micheal(1995).
4.	Management basics for information professionals.	Evans, G. E., Layzell Ward, P., Rugaas, B., & Evans, G. E. (2007).
5.	Computers for librarians: An introduction to the electronic library.	Ferguson, S., & Hebels, R. (2003).
6.	Libraries in society.	Gerard, D. (1978).
7.	Organising knowledge in a global society: Principles and practice in libraries and information centres.	Harvey, D. R., Hider, P., & Harvey, D. R. (2004).
8.	Introduction to reference work: Vol. 1,	Katz, W. A. (2002).
9.	Paper to digital: Documents in the information age.	Liu, Z. (2008).
10.	The practical library manager.	Massis, B. E. (2003).
11.	Internet technologies and information services.	Miller, J. B. (2008).
12.	The electronic library.	Rowley, J. (2001).
13.	Organizing knowledge: An introduction to managing access to information.	Rowley, J. E., & Farrow, J. (2000).
14.	Library and information centre management.	Stueart, R. D. & Moran, B. B. (2007).
15.	The organization of Information.	Taylor, A. G., & Joudrey, D. N. (2008).
16.	The information age: Current controversies.	Torr, J. D. (2003).

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-08/2022-R
Particulars of post	Superintending Engineer (B&R/E&M) (BS-19), M.E.S, Ministry of Defence (Defence Division).
Minimum Qualification & Experience:	i. Master's Degree in Civil / Electrical / Mechanical Engineering from a recognized University. ii. Ten (10) years experience in the field of Civil / Electrical / Mechanical Engineering in BS-17 and above or equivalent.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II (Engineering) (Subjective) : 75 Marks**I. Civil Engineering Fundamentals:**

Structures; stress, strain, shearing force and bending moment concepts, beams, columns, footing. Simply supported and Cantilever beams, Pulleys and gears. Estimation, Quantity Surveying, Composite Schedule of Rates, Surveying and Levelling, Plain Tabling, Theodolite Survey;

II. Costing, Accounting and Budgeting:

Net present value, Net future value, cash flows, auditing, income statement, balance sheet, taxation, financial risk management, cost analysis.

III. Mechanical Engineering Fundamentals

Mechanics and Strength of Materials: Concept of Stress and Strain, bending, torsion, geometric properties of areas, principal stresses, Tensile testing, Stress- Strain curve, True Stress & Strain, Shear Stress & Strain, Concept of elastic and plastic deformation, Yield & ultimate Tensile strengths, Elongation, Toughness and Resilience, Ductility and Malleability, Hardness Testing, Brinell and Rock well Hardness test, bending moment,

Fluid Mechanics: Properties and basics of fluid mechanics, loss of head, power transformation by fluids, pumps, turbines. Fluid static's, Fluid dynamics, Types of flow: Turbulent and Laminar, Reynold's number.

Manufacturing: Different manufacturing processes like Casting, Forging, Machining, Rolling, Extrusion, Wire-drawing, welding, Turning (lathe), Milling, Shaping, Gear cutting, Drilling, Fitting.

IV. Electricity & Electronics

Electricity & Magnetism; Electrical potential, Resistance, Laws of resistance, Conductance, Conductivity, Impedance, Ohm law, Resistance in series and in parallel, practical resistors, work, power, Energy, Joule's law of electric field intensity, Gauss's Theorem, Capacitor, Capacitance, Capacitors in parallel and series. Force on a conductor in a magnetic field, electrical and magnetic circuits, leakage flux, Relation between magnetism and electricity, Induced emf, induced current and directions, Faraday's laws of electromagnetic inductions, Lenz's law, dynamically induced emf, Self inductance, mutual inductance and inductance in series/parallel,

magnetic hysteresis, Energy stored in magnetic field, Generation of alternating currents and voltages.

V. Electrical Machines

DC Motors: Shunt, Series and Compound Motors, Speed and Torque Relations. Transformers: Principle, Construction, Voltage transformation ratio, Step-up/stepdown transformers, Copper & Iron Losses, Transformer connections; delta and star.

AC Motors: Induction motor, Synchronous motor, Performance, Efficiency. Single phase and three phase Motors.

Generators: Principle, Construction, Different components of generators. AC Generators, DC Generators.

VI. Project Management:

Time lines, milestones, resources allocation, dependency, Gant Charts, Preparation of PC-I, PC-II, PC-III & PC-IV, Financial Management of Projects

VII. Inventory Management:

FIFO models, LIFO models, Identification Schemes, Inventory management systems.

VIII. Quality Management Systems:

QA models. Deming, Juran Crosby, Quality circles, management responsibility, quality planning, purchasing, design process and design validation, quality audit, corrective and preventive measures.

SUGGESTED READINGS

S. No.	Title	Author
1.	Plain and reinforced concrete	Nilson.
2.	Strength of material	Andrew Pytel and Singer.
3.	Civil Engineer's Reference Book	LS Blake
4.	Surveying and Levelling	T.P Kanetaker.
5.	Public Health Engineering	STEEL.
6.	Fluid mechanics with engineering applications	Finnemore/ Franzini.
7.	Schaum Outline Series; Strength of Materials	Williym A. Nash
8.	Manufacturing Processes for Engineering Materials	Kalpakgjian
9.	Electrical Technology	B.L. Tharaja
10.	Electronic Devices and Circuits.	Bogart
11.	DC Machines	P.C. Sen
12.	Handbook of Engineering Management	Dennis Lock.
13.	Total Quality Management	Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield, Mary Gesterfield-Sacre

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-09 (A)/2022-R
Particulars of post	Executive Engineer (B&R/E&M) (BS-18) (Civil Engineering), M.E.S, Ministry of Defence (Defence Division).
Minimum Qualification & Experience:	i. Bachelor's degree in Civil/ Electrical/ Mechanical Engineering form a recognized University. ii. Five (5) years post qualification experience in the field of Civil/ Electrical/ Mechanical Engineering in BPS-17 or equivalent.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II (Civil Engineering) (Subjective) : 75 Marks**I. Civil Engineering Fundamentals:**

Structures; stress, strain, shearing force and bending moment concepts, beams, columns, footing. Simply supported and Cantilever beams, Pulleys and gears.

II. Environmental Engineering:

Environmental impacts on water resources projects, transportation engineering projects, waste water treatment and management, water supply and distribution.

III. Fundamentals of Hydraulic Engineering:

Properties of fluid mechanics, pressure measuring devices, flow measuring devices, losses in pipelines, open channels, barrages and dams.

IV. Costing, Accounting and Budgeting:

Net present value, Net future value, cash flows, auditing, income statement, balance sheet, taxation, financial risk management, cost analysis.

V. Project Management:

Time lines, milestones, resources allocation, dependency, Gant Charts,

VI. Inventory Management:

FIFO models, LIFI models, Identification Schemes, Inventory management systems.

VII. Quality Management Systems:

QA modles. Deming, Juran Crosby, Quality circles, management responsibility, quality planning, purchasing, design process and design validation, quality audit, corrective and preventive measures.

SUGGESTED READINGS

S.No.	Title	Author
1.	Properties of Concrete	A.M. Neville.
2.	Plain and reinforced concrete	Nilson.
3.	Strength of material	Andrew Pytel and Singer.
4.	Transportation Engineering, Planning and design	Paul Wright.
5.	Civil Engineer's Reference Book	LS Blake
6.	Surveying and Leveling	T.P Kanetaker.
7.	Public Health Engineering	STEEL.
8.	Fluid mechanics with engineering applications	Finnemore/ Franzini.
9.	Handbook of Engineering Management	Dennis Lock.
10.	Total Quality Management	Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield, Mary Gesterfield-Sacre

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-09 (B)/2022-R
Particulars of post	Executive Engineer (B&R/E&M) (BS-18) (Electrical Engineering) , M.E.S, Ministry of Defence (Defence Division).
Minimum Qualification & Experience:	i. Bachelor's degree in Civil/ Electrical/ Mechanical Engineering form a recognized University. ii. Five (5) years post qualification experience in the field of Civil/ Electrical/ Mechanical Engineering in BPS-17 or equivalent.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II (Electrical Engineering) (Subjective) : 75 Marks**I. Electricity & Electronics:**

Electricity & Magnetism; Electrical potential, Resistance, Laws of resistance, Conductance, Conductivity, Impedance, Ohm law, Resistance in series and in parallel, practical resistors, work, power, Energy, Joule's law of electric field intensity, Gauss's Theorem, Capacitor, Capacitance, Capacitors in parallel and series. Force on a conductor in a magnetic field, electrical and magnetic circuits, leakage flux, Relation between magnetism and electricity, Induced emf, induced current and directions, Faraday's laws of electromagnetic inductions, Lenz's law, dynamically induced emf, Self inductance, mutual inductance and inductance in series/parallel, magnetic hysteresis, Energy stored in magnetic field, Generation of alternating currents and voltages.

II. Electrical Machines:

DC Motors: Shunt, Series and Compound Motors, Speed and Torque Relations. Transformers: Principle, Construction, Voltage transformation ratio, Step-up/stepdown transformers, Copper & Iron Losses, Transformer connections; delta and star.

AC Motors: Induction motor, Synchronous motor, Performance, Efficiency. Single phase and three phase Motors.

Generators: Principle, Construction, Different components of generators. AC Generators, DC Generators.

III. Power Systems:

Power network analysis, Polyphase circuits, Transients, Transmission Lines, Losses.

IV. Costing, Accounting and Budgeting:

Net present value, Net future value, cash flows, auditing, income statement, balance sheet, taxation, financial risk management, cost analysis.

V. Project Management:

Time lines, milestones, resources allocation, dependency, Gant Charts,

VI. Inventory Management:

FIFO models, LIFI models, Identification Schemes, Inventory management systems.

VII. Quality Management Systems:

QA models. Deming, Juran Crosby, Quality circles, management responsibility, quality planning, purchasing, design process and design validation, quality audit, corrective and preventive measures.

SUGGESTED READINGS

S. No.	Title	Author
1.	Electrical Technology	B.L. Tharaja
2.	Electronic Devices and Circuits.	Bogart
3.	DC Machines	P.C. Sen
4.	Handbook of Engineering Management	Dennis Lock.
5.	Total Quality Management	Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield, Mary Gesterfield-Sacre

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-09 (C)/2022-R
Particulars of post	Executive Engineer (B&R/E&M) (BS-18) (Mechanical Engineering) , M.E.S, Ministry of Defence (Defence Division).
Minimum Qualification & Experience:	i. Bachelor's degree in Civil/ Electrical/ Mechanical Engineering form a recognized University. ii. Five (5) years post qualification experience in the field of Civil/ Electrical/ Mechanical Engineering in BPS-17 or equivalent.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II: (Mechanical Engineering) (Subjective) : 75 Marks**I. Mechanics and Strength of Materials:**

Concept of Stress and Strain, bending, torsion, geometric properties of areas, principal stresses, Tensile testing, Stress- Strain curve, Difference between Engineering and True stress & Strain, Shear Stress & Strain, Concept of elastic and plastic deformation, Yield & ultimate Tensile strengths, Elongation, Toughness and Resilience, Ductility and Malleability, Hardness Testing, Brinell and Rock well Hardness test, bending moment,

II. Fluid Mechanics:

Properties and basics of fluid mechanics, loss of head, power transformation by fluids, pumps, turbines. Fluid static's, Fluid dynamics, Types of flow: Turbulent and Laminar, Reynold's number.

III. Thermodynamics and Heat Transfer

Basics of thermodynamics, properties of fluids and steam, steam turbines, power plants. First and second Laws of Thermodynamics, Enthalpy, Entropy, Heat Capacity, Carnot cycle, Gibbs free energy, Equilibrium, PV – diagrams, Refrigeration and Air conditioning, principle and models of heat transfer, Evaporators, Condensers, Heat engines, Engines (2 and 4 strokes).

IV. Manufacturing:

Different manufacturing processes like Casting, Forging, Machining, Rolling, Extrusion, Wire-drawing, welding, Turning (lathe), Milling, Shaping, Gear cutting, Drilling, Fitting.

SUGGESTED READINGS

S. No.	Title	Author
1.	Fluid mechanics with engineering applications	Finnemore/ Franzini.
2.	Schaum Outline Series; Strength of Materials	Williym A. Nash
3.	Fluid Mechanics	Lewitt
4.	Engineering Mechanics (Statics)	J.L. Merriems.
5.	Testing of Metals	Fazal Karim
6.	Manufacturing Processes for Engineering Materials	Kalpajjian

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-13/2022-R
Particulars of post	Assistant Headmistress (BS-18), Islamabad Model Colleges, Federal Directorate of Education, Ministry of Federal Education & Professional Training.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's degree or equivalent qualification with B.Ed. / M.Ed. ii. Five (5) years post qualification teaching and administrative experience in recognized educational institutions.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II: 50 Marks (Descriptive)

(Human Resource, Financial Management,
Quality Management and Information Technology)

I. Human Resource and Financial Management

Definition, Significance and Scope of Human Resource Management; Organization—Types of Organization, Theory of Organization, Principles of Organization, Organization of the Federal and Provincial Governments, Public Sector Enterprises; Approaches to Human Resource Management. Personnel Administration—Tools of Personnel Management: Selection, Training, Promotion, Compensation, Discipline; Communication, Communication Channels and Principles of Public Relations; Human Behaviour and Organizations Administration.—Elements of Financial Administration, Performance Programmed Budgeting, Capital Budget, Principles of Budgeting, Auditing and Accounting.

II. Basic Concept of Quality Management

ISO-9000, ISO-13000, other certifications regarding quality measurement; management, management for Results, Setting Performance Goals and Targets; Job Analysis: Job Description, Job Specification, Performance Evaluation;

III. Information Technology and MS Office

Fundamentals of Computer: CPU, Memory Devices, Types of Computers, Characteristics of Computer and related material; Application Software: Microsoft Word, Microsoft Power Point, Microsoft Excel; Search Engines, Web Design, Email, Internet Surfing, Social Networking (Facebook, Twitter, etc); General Introduction to Virus and Antivirus utilities; Programming Languages

Part-III: (Professional) 25 Marks (Descriptive)**I. Development of Curriculum and Instructional Material**

- Elements of Curriculum.
- Curriculum Development Process: Need Assessment, Formulation of Aims and Objectives, Taxonomies of Educational Objectives, Selection of Content, Development of Curricular Materials.

II. Process of Teaching and Teaching Strategies

- Process of Classroom Communication
- Factors affecting Classroom Communication
- Barriers to Classroom Communications
- Use of Instructional Materials and Media

III. Educational Assessment and Evaluation

- Concept of Classroom Assessment and Evaluation
- Distinction between Assessment, Evaluation and Measurement
- Approaches to Evaluation: Formative Evaluation; Summative Evaluation
- Types of Test: Essay Type; Objective Type: Multiple Choice, True-False Items, Matching Type; Principles of Construction of these Test
- Characteristics of a Good Test: Validity, Reliability, Objectivity, Usability

IV. Research Methods in Education

- Research Instruments: Questionnaire: Interview; Test; Observation; Rating Scale
- Research Proposal and Report Writing

SUGGESTED READINGS

S. No.	Title	Author
1.	Human Resource Management	H.T.Graham & Roger Bennett
2.	Management	James A.F.Stoner, R.Eward Freeman, Daniel R.Gilbert Jr.
3.	Understanding Computer: Today and Tomorrow	Deborah Morley, Charles Parker
4.	MS Office 365 Handbook: 2013 Edition	Kevin Wilson
5.	Research in Education	JW Best
6.	Integrating Education Technology into Teaching	Roblyer
7.	Curriculum Development	S. M. Shahid
8.	Educational Measurement and Evaluation	S. M. Shahid
9.	Educational Administration	S. M. Shahid

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-16/2022-R
Particulars of post	Principal (Female) (BS-19), Federal Directorate of Education, Ministry of Federal Education & Professional Training.
Minimum Qualification & Experience:	<p>i. Second Class or Grade 'C' Master's Degree/ Bachelor's degree (04 years duration) with Second Class or Grade 'C' M.Ed/ B.Ed (Hons) or equivalent qualification from a University recognized by HEC. Requirement of M.Ed/ B.Ed (Hons) is exempted for those having Master's/ M.Phil/ Ph.D degree in Education.</p> <p>ii. Twelve (12) years post qualification experience in Teaching and Administration in a recognized Educational Institution.</p>

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II: 50 Marks

(Human Resource, Financial Management,
Quality Management and Information Technology)

I. Human Resource and Financial Management

Definition, Significance and Scope of Human Resource Management; Organization—Types of Organization, Theory of Organization, Principles of Organization, Organization of the Federal and Provincial Governments, Public Sector Enterprises; Approaches to Human Resource Management. Personnel Administration—Tools of Personnel Management: Selection, Training, Promotion, Compensation, Discipline; Communication, Communication Channels and Principles of Public Relations; Human Behaviour and Organizations Administration.—Elements of Financial Administration, Performance Programmed Budgeting, Capital Budget, Principles of Budgeting, Auditing and Accounting.

II. Basic Concept of Quality Management

ISO-9000, ISO-13000, other certifications regarding quality measurement; management, management for Results, Setting Performance Goals and Targets; Job Analysis: Job Description, Job Specification, Performance Evaluation;

III. Information Technology and MS Office

Fundamentals of Computer: CPU, Memory Devices, Types of Computers, Characteristics of Computer and related material; Application Software: Microsoft Word, Microsoft Power Point, Microsoft Excel; Search Engines, Web Design, Email, Internet Surfing, Social Networking (Facebook, Twitter, etc); General Introduction to Virus and Antivirus utilities; Programming Languages

Part-III: (Professional) 25 Marks (Descriptive)**I. Development of Curriculum and Instructional Material**

- Elements of Curriculum.
- Curriculum Development Process: Need Assessment, Formulation of Aims and Objectives, Taxonomies of Educational Objectives, Selection of Content, Development of Curricular Materials.

II. Process of Teaching and Teaching Strategies

- Process of Classroom Communication
- Factors affecting Classroom Communication
- Barriers to Classroom Communications
- Use of Instructional Materials and Media

III. Educational Assessment and Evaluation

- Concept of Classroom Assessment and Evaluation
- Distinction between Assessment, Evaluation and Measurement
- Approaches to Evaluation: Formative Evaluation; Summative Evaluation
- Types of Test: Essay Type; Objective Type: Multiple Choice, True-False Items, Matching Type; Principles of Construction of these Test
- Characteristics of a Good Test: Validity, Reliability, Objectivity, Usability

IV. Research Methods in Education

- Research Instruments: Questionnaire: Interview; Test; Observation; Rating Scale
- Research Proposal and Report Writing

SUGGESTED READINGS

S. No.	Title	Author
1.	Human Resource Management	H.T.Graham & Roger Bennett
2.	Management	James A.F.Stoner, R.Eward Freeman, Daniel R.Gilbert Jr.
3.	Understanding Computer: Today and Tomorrow	Deborah Morley, Charles Parker
4.	MS Office 365 Handbook: 2013 Edition	Kevin Wilson
5.	Research in Education	JW Best
6.	Integrating Education Technology into Teaching	Roblyer
7.	Curriculum Development	S. M. Shahid
8.	Educational Measurement and Evaluation	S. M. Shahid
9.	Educational Administration	S. M. Shahid

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-17(A)/2022-R
Particulars of post	Assistant Professor (Male) (Mathematics) (BS-18), Federal Government Educational Institutions (FGEI) (Cantts/Garrisons), Ministry of Defence.
Minimum Qualification & Experience:	Ph.D. Degree in the relevant subject with one (1) year post qualification teaching experience at College/ University level OR M.Phil Degree in the relevant subject with three (3) years post qualification teaching experience at College/ University level OR Second Class or Grade 'C' Master's Degree in the relevant subject with five (5) years post qualification teaching experience at College/ University level.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II: (Mathematics)**50 Marks (Descriptive)****I. Vector Calculus**

Vector algebra; scalar and vector products of vectors; gradient divergence and curl of a vector; line, surface and volume integrals; Green's, Stokes' and Gauss theorems.

II. Statics

Composition and resolution of forces; parallel forces and couples; equilibrium of a system of coplanar forces; centre of mass of a system of particles and rigid bodies; equilibrium of forces in three dimensions.

III. Dynamics

- Motion in a straight line with constant and variable acceleration; simple harmonic motion; conservative forces and principles of energy.
- Tangential, normal, radial and transverse components of velocity and acceleration; motion under central forces; planetary orbits; Kepler laws;

IV. Ordinary differential equations

- Equations of first order; separable equations, exact equations; first order linear equations; orthogonal trajectories; nonlinear equations reducible to linear equations, Bernoulli and Riccati equations.
- Equations with constant coefficients; homogeneous and inhomogeneous equations; Cauchy-Euler equations; variation of parameters.
- Ordinary and singular points of a differential equation; solution in series; Bessel and Legendre equations; properties of the Bessel functions and Legendre polynomials.

V. Fourier series and partial differential equations

- Trigonometric Fourier series; sine and cosine series; Bessel inequality; summation of infinite series; convergence of the Fourier series.
- Partial differential equations of first order; classification of partial differential equations of second order; boundary value problems; solution by the method of separation of variables; problems associated with Laplace equation, wave equation and the heat equation in Cartesian coordinates.

VI. Numerical Methods

- Solution of nonlinear equations by bisection, secant and Newton-Raphson methods; the fixed- point iterative method; order of convergence of a method.
- Solution of a system of linear equations; diagonally dominant systems; the Jacobi and Gauss-Seidel methods.
- Numerical solution of an ordinary differential equation; Euler and modified Euler methods; Runge- Kutta methods.

Part-III: (Professional) 25 Marks (Descriptive)

I. Development of Curriculum and Instructional Material

- Elements of Curriculum.
- Curriculum Development Process: Need Assessment, Formulation of Aims and Objectives, Taxonomies of Educational Objectives, Selection of Content, Development of Curricular Materials.

II. Process of Teaching and Teaching Strategies

- Process of Classroom Communication
- Factors affecting Classroom Communication
- Barriers to Classroom Communications
- Use of Instructional Materials and Media

III. Educational Assessment and Evaluation

- Concept of Classroom Assessment and Evaluation
- Distinction between Assessment, Evaluation and Measurement
- Approaches to Evaluation: Formative Evaluation; Summative Evaluation
- Types of Test: Essay Type; Objective Type: Multiple Choice, True-False Items, Matching Type; Principles of Construction of these Test
- Characteristics of a Good Test: Validity, Reliability, Objectivity, Usability

IV. Research Methods in Education

- Research Instruments: Questionnaire: Interview; Test; Observation; Rating Scale
- Research Proposal and Report Writing

SUGGESTED READINGS

S. No.	Title	Author
1.	An Introduction to Vector Analysis	Khalid Latif,
2.	Introduction to Mechanics	Q.K. Ghori
3.	An Intermediate Course in Theoretical Mechanics	Khalid Latif,
4.	Differential Equations with Boundary Value Problems	D. G. Zill and M. R. Cullen
5.	Elementary Differential Equations	E.D. Rainville, P.E. Bedient and R.E. Bedient
6.	Elements of Numerical Analysis	F. Ahmad and M.A Rana
7.	Mathematical Methods	S. M. Yousaf, Abdul Majeed and Muhammad Amin
8.	Research in Education	JW Best
9.	Integrating Education Technology into Teaching	Roblyer
10.	Curriculum Development	S.M. Shahid
11.	Educational Measurement and Evaluation	S.M. Shahid
12.	Educational Administration	S.M. Shahid

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-17(B)/2022-R
Particulars of post	Assistant Professor (Male) (Chemistry) (BS-18), Federal Government Educational Institutions (FGEI) (Cantts/Garrisons), Ministry of Defence.
Minimum Qualification & Experience:	Ph.D. Degree in the relevant subject with one (1) year post qualification teaching experience at College/ University level OR M.Phil Degree in the relevant subject with three (3) years post qualification teaching experience at College/ University level OR Second Class or Grade 'C' Master's Degree in the relevant subject with five (5) years post qualification teaching experience at College/ University level.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II: (Chemistry)**50 Marks (Descriptive)**

- I. Atomic structure.—Quantum theory, Schrodinger equation, Particle in box, hydrogen atom. Hydrogen molecule ion, hydrogen molecule. Theories of hydrogen and metallic bonding.
- II. Electrochemistry.—Ionic equilibria, theory of strong electrolytes; Debye-Huckel theory of activity coefficients, galvanic cells, membrane equilibria and fuel cells. Theories of Acids and Bases, glass electrode, measurement of pH. Electrolysis, overvoltage and corrosion.
- III. Thermodynamics.—First law of thermodynamics, internal energy, enthalpy functions. Thermochemistry, Entropy and second law of Thermodynamics, Free energy and chemical equilibrium.
- IV. Chemistry of Following Elements.—Oxygen, Carbon, Chlorine, Silicon, Nitrogen, Phosphorus.
- V. Inorganic Chemical Industries.—Sulphuric Acid, Fixation of Nitrogen, Chemical Fertilizers, Semi-conductivity devices. Cement, Glass and Ceramics.
- VI. Chemical Kinetics.—Rate law and its determination Order of reaction. Experimental methods. Temperature Dependence of rate constants. Study of mechanism of a few selected reactions (1st and 2nd under reaction only).
- VII. Surface Chemistry and Catalysis.—Physical adsorption and chemisorption. Surface area determination. Homogeneous and Heterogeneous Catalysis. Acid-base and Enzyme Catalysis.
- VIII. Physical Organic Chemistry.—Elements of Organic reaction mechanism. Optical and Geometric Isomerism. Conformational analysis. Resonance. H—Bond and its effects on the properties of Organic Compounds.
- IX. Aromatic Chemistry.—Structure of Benzene with particular reference to Mechanism of Electrophilic Substitution Reactions.
- X. Chemistry of Natural Products.—Elementary study of Carbohydrates. Oils and Fats. Alkaloids and Vitamins.
- XI. Industrial Organic Chemistry.—Organic Polymers. Fermentation processes including preparation of Anti-Biotics. Petro-Chemical Industry.

Part-III: (Professional) 25 Marks (Descriptive)

- I. Development of Curriculum and Instructional Material**
 - Elements of Curriculum.
 - Curriculum Development Process: Need Assessment, Formulation of Aims and Objectives, Taxonomies of Educational Objectives, Selection of Content, Development of Curricular Materials.
- II. Process of Teaching and Teaching Strategies**
 - Process of Classroom Communication
 - Factors affecting Classroom Communication
 - Barriers to Classroom Communications
 - Use of Instructional Materials and Media
- III. Educational Assessment and Evaluation**
 - Concept of Classroom Assessment and Evaluation
 - Distinction between Assessment, Evaluation and Measurement
 - Approaches to Evaluation: Formative Evaluation; Summative Evaluation
 - Types of Test: Essay Type; Objective Type: Multiple Choice, True-False Items, Matching Type; Principles of Construction of these Test
 - Characteristics of a Good Test: Validity, Reliability, Objectivity, Usability
- IV. Research Methods in Education**
 - Research Instruments: Questionnaire: Interview; Test; Observation; Rating Scale
 - Research Proposal and Report Writing
 -

SUGGESTED READINGS

S. No.	Title	Author
1.	Advanced Inorganic Chemistry 3 rd Ed.	Cotton. F.A. and Wilkinson Groffrey
2.	Inorganic Chemistry, 3 rd Ed. 1983	Hukeavy, James E.
3.	Physical Chemistry 5 th Ed.	Moore, Walter J.
4.	Mechanism & Structure in Organic Chemistry	Gould, Edwards
5.	Organic Chemistry 2 nd Ed.	Morrison, Robert Thornton & Boyd R.N.
6.	Research in Education	JW Best
7.	Integrating Education Technology into Teaching	Roblyer
8.	Curriculum Development	S. M. Shahid
9.	Educational Measurement and Evaluation	S. M. Shahid
10.	Educational Administration	S. M. Shahid

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-17(C)/2022-R
Particulars of post	Assistant Professor (Male) (Statistics) (BS-18), Federal Government Educational Institutions (FGEI) (Cantts/Garrisons), Ministry of Defence.
Minimum Qualification & Experience:	Ph.D. Degree in the relevant subject with one (1) year post qualification teaching experience at College/ University level OR M.Phil Degree in the relevant subject with three (3) years post qualification teaching experience at College/ University level OR Second Class or Grade 'C' Master's Degree in the relevant subject with five (5) years post qualification teaching experience at College/ University level.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II (Statistics) 50 Marks (Descriptive)**I. Probability Distributions**

Discrete and continuous Probability Distributions. Properties, applications of Binomial, Poisson, Hyper-geometric, Normal Distribution and its properties, Standard Normal Curve, Normal approximation to Binomial and Poisson distribution.

II. Regression Analysis & Correlation Analysis

Concepts of Regression and Correlation and their application, Simple and Multiple Linear Regression (upto three variables), Estimation of the Parameters, Method of least square, Inference regarding regression parameters

Correlation, Correlation Coefficient, Properties of Correlation Coefficient, Inference regarding correlation coefficient, Partial Correlation and Multiple Correlation (upto three variables).

III. Sampling & Sampling Distributions

Population and Sample, Advantages of Sampling, Sampling Design, Probability & Non-Probability Sampling techniques. Brief Concepts of Simple Random, Stratified, Systematic, Cluster, Multiple and Multistage Sampling. Purposive, Quota Sampling, Convenience & Accidental Sampling.

Sampling with and without replacement, Application of Central Limit Theorem in Sampling, Sampling Distribution of Mean, difference between two Means, Proportion, difference between two Proportion and Variance.

IV. Statistical Inferences

Estimation: Point Estimation, Properties of a good Estimator. Interval Estimation. Interval Estimation of Population mean. Large and small sample confidence intervals for Population Mean.

Hypothesis Testing: Types of errors. Hypothesis Testing for Population Mean. Inferences for Two Population Means. Inferences for the Mean of Two Normal Populations using Independent Samples (variances are assumed Equal). Inference

for Two Populations Mean using Paired Samples. Inferences for Population Proportions. Confidence Intervals and hypothesis Testing for Population Proportion. Inferences for Two Populations Proportions using Independent Samples, Estimation of sample size

Analysis of categorized data. Goodness of fit tests. Contingency tables. Test of independence in contingency tables.

V. Design of Experiments

One-way and Two-way Analysis of Variance, Design of Experiments, Concepts of Treatment, Replication, Blocking, Experimental Units and Experimental Error, Basic Principles of Design of Experiments, Description, Layout and Statistical Analysis of Completely Randomized Design (CRD), Randomized Complete Block Design (RCBD), Multiple Comparison tests (LSD test).

Part-III: (Professional) 25 Marks (Descriptive)

I. Development of Curriculum and Instructional Material

- Elements of Curriculum.
- Curriculum Development Process: Need Assessment, Formulation of Aims and Objectives, Taxonomies of Educational Objectives, Selection of Content, Development of Curricular Materials.

II. Process of Teaching and Teaching Strategies

- Process of Classroom Communication
- Factors affecting Classroom Communication
- Barriers to Classroom Communications
- Use of Instructional Materials and Media

III. Educational Assessment and Evaluation

- Concept of Classroom Assessment and Evaluation
- Distinction between Assessment, Evaluation and Measurement
- Approaches to Evaluation: Formative Evaluation; Summative Evaluation
- Types of Test: Essay Type; Objective Type: Multiple Choice, True-False Items, Matching Type; Principles of Construction of these Test
- Characteristics of a Good Test: Validity, Reliability, Objectivity, Usability

IV. Research Methods in Education

- Research Instruments: Questionnaire: Interview; Test; Observation; Rating Scale
- Research Proposal and Report Writing

SUGGESTED READINGS

S. No.	Title	Author
1.	Principles and Procedures of Statistics	Steel, R and Torrie, J.H.
2.	Introduction to Statistical Theory, Part-I & II	Chaudhry, S.M. and Kamal, S.
3.	Fundamentals of Modern Statistical Methods	Wilcox, R.
4.	Statistical Methods	Aggarwal, Y.P.
5.	Research in Education	JW Best
6.	Integrating Education Technology into Teaching	Roblyer
7.	Curriculum Development	S. M. Shahid
8.	Educational Measurement and Evaluation	S. M. Shahid
9.	Educational Administration	S. M. Shahid

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-17(D)/2022-R
Particulars of post	Assistant Professor (Male) (Computer Science) (BS-18), Federal Government Educational Institutions (FGEI) (Cantts/ Garrisons), Ministry of Defence.
Minimum Qualification & Experience:	Ph.D. Degree in the relevant subject with one (1) year post qualification teaching experience at College/ University level OR M.Phil Degree in the relevant subject with three (3) years post qualification teaching experience at College/ University level OR Second Class or Grade 'C' Master's Degree in the relevant subject with five (5) years post qualification teaching experience at College/ University level.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II: (Computer Science)**50 Marks (Descriptive)****I. Computer Architecture**

Microprocessor Bus Structure (Address/Data/Control), Registers and Flags, Storage Hierarchy (Main/Virtual/Cache/Secondary memory), Peripheral communication, CPU, ALU, Principles of Instruction Set Design, Multiprocessors & Thread Level Parallelism.

II. Object Oriented Programming

Data types, control structures, functions, arrays, classes, methods, object and encapsulation; constructors and destructors, operator and function overloading, virtual functions, derived classes, inheritance and polymorphism, I/O and file processing.

III. Data Structure and Algorithms

Stack and Queue, Sequential Search, Binary Search, Bubble sort, Merge sort, Quick sort, Insertion sort, Selection Sort, Linked Lists, Infix to postfix conversions, Expression tree construction, Tree traversals, Graph representation and traversal, Minimum spanning tree.

IV. Database Management Systems

Entity Relationship modeling, Relational data model and algebra, Structured Query language, Database design, functional dependencies and normal forms, concurrency control and recovery techniques, Database security and authorization.

V. Computer Communications and Networks

Asynchronous and Synchronous transmission, LAN/WAN/MAN, Network layers, Transport layer protocols TCP/IP, UDP, Error Control, Flow Control, Multiplexing, Routing, Bridging, Network security issues.

VI. Operating Systems

Process and CPU management, Multithreading, Deadlocks, Memory management and virtual memory, External Fragmentation, Paging and Demand Paging, File management systems, Scheduling and dispatch, Introduction to concurrency.

Part-III: (Professional) 25 Marks (Descriptive)

- I. Development of Curriculum and Instructional Material**
 - Elements of Curriculum.
 - Curriculum Development Process: Need Assessment, Formulation of Aims and Objectives, Taxonomies of Educational Objectives, Selection of Content, Development of Curricular Materials.
- II. Process of Teaching and Teaching Strategies**
 - Process of Classroom Communication
 - Factors affecting Classroom Communication
 - Barriers to Classroom Communications
 - Use of Instructional Materials and Media
- III. Educational Assessment and Evaluation**
 - Concept of Classroom Assessment and Evaluation
 - Distinction between Assessment, Evaluation and Measurement
 - Approaches to Evaluation: Formative Evaluation; Summative Evaluation
 - Types of Test: Essay Type; Objective Type: Multiple Choice, True-False Items, Matching Type; Principles of Construction of these Test
 - Characteristics of a Good Test: Validity, Reliability, Objectivity, Usability
- IV. Research Methods in Education**
 - Research Instruments: Questionnaire; Interview; Test; Observation; Rating Scale
 - Research Proposal and Report Writing
 -

Suggested Reading

S.No.	Title	Author
1.	Modern Operating Systems	Andrew S. Tanenbaum
2.	Operating System Concepts	Addison-Wesley
3.	Algorithms and Data Structures	N. Wirth
4.	Data structures	Aaron M. Tanenbaum,
5.	Database Systems: A Practical Approach to Design, Implementation and Management	R.Connolly and P.Begg
6.	Introduction to Computer Networks	A. S. Tanenbaum
7.	Computer Networks and Internets	Douglas E. Comer
8.	Computer Architecture: A Quantitative Approach	Hennessy & Patterson
9.	Research in Education	JW Best
10.	Integrating Education Technology into Teaching	Roblyer
11.	Curriculum Development	S.M. Shahid
12.	Educational Measurement and Evaluation	S.M. Shahid
13.	Educational Administration	S.M. Shahid

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-18/2022-R
Particulars of post	Deputy Chief (BS-19), Transport & Communication Section, Ministry of Planning, Development and Special Initiatives.
Minimum Qualification & Experience:	i. Bachelor's degree or equivalent qualifications in Civil Engineering or Electrical Engineering. ii. Ten (10) years post qualification experience of work and/or research relating to transport, ports, roads, bridges, telegraphs, telephones, radio or other branches of transport or communication. iii. PEC registration required.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II (Research and Planning) (Subjective) : 25 Marks**I. Communication Skills, Technical Writing and Presentation Skills**

Paragraph writing, Essay writing, Translation skills, Study skills, Academic skills, Academic writing, Technical Report writing, Progress report writing, Presentation skills

II. Planning and Managementa) Project Management

Project Management, Processes Integration Management, Project Plan Development, Project Plan Execution and Overall Change Control, PERT, Gantt Chart, CPM

b) Scope Management

Initiation, Scope Planning, Scope Definition, Scope Verification and Scope Change Control.

c) Communications Management

Communications Planning, Information Distribution, Performance Reporting and Administrative Closure.

d) Risk Management

Risk Identification, Risk Quantification, Risk Response Development and Risk Response Control.

e) Statistical Techniques

All statistical techniques related to Planning & Research

Part-III (Professional) (Subjective) : 50 Marks**I. Civil Engineering Fundamentals:**

Structures; stress, strain, shearing force and bending moment concepts, beams, columns, footing. Simply supported and Cantilever beams, Pulleys and gears. Estimation, Quantity Surveying, Composite Schedule of Rates, Surveying and Levelling, Plain Tabling, Theodolite Survey;

II. Costing, Accounting and Budgeting:

Net present value, Net future value, cash flows, auditing, income statement, balance sheet, taxation, financial risk management, cost analysis.

III. Electricity & Electronics

Electricity & Magnetism; Electrical potential, Resistance, Laws of resistance, Conductance, Conductivity, Impedance, Ohm law, Resistance in series and in parallel, practical resistors, work, power, Energy, Joule's law of electric field intensity, Gauss's Theorem, Capacitor, Capacitance, Capacitors in parallel and series. Force on a conductor in a magnetic field, electrical and magnetic circuits, leakage flux, Relation between magnetism and electricity, Induced emf, induced current and directions, Faraday's laws of electromagnetic inductions, Lenz's law, dynamically induced emf, Self inductance, mutual inductance and inductance in series/parallel, magnetic hysteresis, Energy stored in magnetic field, Generation of alternating currents and voltages.

IV. Electrical Machines

DC Motors: Shunt, Series and Compound Motors, Speed and Torque Relations. Transformers: Principle, Construction, Voltage transformation ratio, Step-up/stepdown transformers, Copper & Iron Losses, Transformer connections; delta and star.

AC Motors: Induction motor, Synchronous motor, Performance, Efficiency. Single phase and three phase Motors.

Generators: Principle, Construction, Different components of generators. AC Generators, DC Generators.

SUGGESTED READINGS

S. No.	Title	Author
1.	Practical English Grammar	A.J. Thomson and A.V. Martinet.
2.	Writing. Upper-Intermediate	Rob Nolasco.
3.	Study Skills	Riachard Yorky
4.	Writing. Advanced	Ron White.
5.	College Writing Skills	John Langan.
6.	Project Management Body of Knowledge,	Project Management Institute (PMI) standards committee
7.	Software Project Management	S.A. Kelkar, A Concise Study, Prentice Hall of India.
8.	Plain and reinforced concrete	Nilson.
9.	Strength of material	Andrew Pytel and Singer.
10.	Civil Engineer's Reference Book	LS Blake
11.	Surveying and Levelling	T.P Kanetaker.
12.	Public Health Engineering	STEEL.
13.	Fluid mechanics with engineering applications	Finnemore/ Franzini.
14.	Electrical Technology	B.L. Tharaja
15.	Electronic Devices and Circuits.	Bogart

PAPER-II: PROFESSIONALMax Marks: 100Time Allowed: 3 Hours

Case No.	F.4-21/2022-R
Particulars of post	Assistant Chief (BS-18), Public Administration Section, Ministry of Planning, Development and Special Initiatives.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's degree or equivalent qualifications in Political Science or Public Administration or Business Administration. ii. Three (3) years post qualification experience of work and / or research in the field of public administration.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II: 50 Marks

(Public Administration & Office Management)

- I. **Public Administration:** Nature and scope, Role of Public Administration in a modern Welfare State;
- II. **Bureaucracy:** Concept of Bureaucracy, Theories of Bureaucracy, Ecology of Bureaucracy; Bureaucracy of Pakistan as a Change Agent;
- III. **Administrative Leadership:** Approaches to the study of Leadership, Forms of Leadership, Leadership qualities;
- IV. **Administrative Accountability:** Internal and External Controls; Executive Control, Legislative Control, Judicial Control, Ombudsman, Public Opinion and Pressure Groups; Problems of Administrative Accountability in Pakistan;
- V. **Planning:** Types of Plans, Planning Process; Principles of Planning, Planning Machinery in Pakistan;
- VI. **Controlling and Co-Ordination:** Forms of Controls, Controls, Control Mechanism, the process of Control, Principles of Controlling; Principles of Coordination; Machinery for Coordination; Problems of Coordination in Public Administration in Pakistan.
- VII. Civil Servant Act 1973 and Rules made thereunder;
- VIII. Rules of Business 1973;
- IX. Secretariat Instructions and Office Procedures;
- X. PPRA Ordinance and Rules 2004.

Part-III: 25 Marks

(Human Resource, Financial Management,
Quality Management and Information Technology)

I. Human Resource and Financial Management

Definition, Significance and Scope of Human Resource Management; Organization—Types of Organization, Theory of Organization, Principles of Organization, Organization of the Federal and Provincial Governments, Public Sector Enterprises; Approaches to Human Resource Management. Personnel Administration—Tools of Personnel Management: Selection, Training, Promotion, Compensation, Discipline; Communication, Communication Channels and Principles of Public Relations; Human Behaviour and Organizations Administration.—Elements of Financial Administration, Performance Programmed Budgeting, Capital Budget, Principles of Budgeting, Auditing and Accounting.

II. Basic Concept of Quality Management

ISO-9000, ISO-13000, other certifications regarding quality measurement; management, management for Results, Setting Performance Goals and Targets; Job Analysis: Job Description, Job Specification, Performance Evaluation;

SUGGESTED READINGS

S. No.	Title	Author
1.	An Introduction to the Public Administration	E.N. Cladden
2.	Bureaucracy: Modern Society	Pebr, M.Blau.
3.	Public Administration for a Welfare State	Paul Ableby
4.	The Bureaucracy of Pakistan	Charles F. Kennedy
5.	Human Resource Management	H.T.Graham & Roger Bennett
6.	Management	James A.F.Stoner, R.Eward Freeman, Daniel R.Gilbert Jr.

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-23/2022-R
Particulars of post	Assistant Chief (BS-18), Health Section, Ministry of Planning, Development and Special Initiatives.
Minimum Qualification & Experience:	i. Second Class or Grade 'C' Master's Degree or equivalent qualifications in Health Planning, Nutrition Planning. OR M.B.B.S. or equivalent. ii. Three (3) years post qualification experience of work and/ or research relating to medicine, surgery or public health or in planning and development in these fields.

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II & III.

Part-II (Research and Planning) (Subjective) : 25 Marks**I. Communication Skills, Technical Writing and Presentation Skills**

Paragraph writing, Essay writing, Translation skills, Study skills, Academic skills, Academic writing, Technical Report writing, Progress report writing, Presentation skills

II. Planning and Managementf) Project Management

Project Management, Processes Integration Management, Project Plan Development, Project Plan Execution and Overall Change Control, PERT, Gantt Chart, CPM

g) Scope Management

Initiation, Scope Planning, Scope Definition, Scope Verification and Scope Change Control.

h) Communications Management

Communications Planning, Information Distribution, Performance Reporting and Administrative Closure.

i) Risk Management

Risk Identification, Risk Quantification, Risk Response Development and Risk Response Control.

j) Statistical Techniques

All statistical techniques related to Planning & Research

Part-III (Professional) (Subjective) : 50 Marks**i. Meaning and Significance of Health Education**

- a. Definition and scope of Health Education
- b. Relationship of Health Education with Physical Education
- c. Importance of Health Education in Community

ii. Community Health

- a. Concepts in Community Health
- b. Health & Welfare
- c. Health & Development

- d. Infectious diseases, Epidemiology
 - e. Disease Transmission
 - f. Immunity
 - g. Disease prevention and control
 - h. Disinfection
 - i. Symptoms, causes and prevention of most common communicable diseases
 - j. Epidemiology of non-communicable diseases and condition
- iii. **Environment and Human Health**
- a. Toxic pollutants and their effect on health
 - b. Mechanisms of action of drugs producing toxic effects of drugs on human body
 - c. Carcinogenic agents
 - d. Chemicals in food
 - e. Biological effects of Radiation
 - f. Sources of pollution: Air, Water, Noise

SUGGESTED READINGS

S. No.	Titles	Author
1.	Practical English Grammar	A.J. Thomson and A.V. Martinet.
2.	Writing. Upper-Intermediate	Rob Nolasco.
3.	Study Skills	Riachard Yorky
4.	Writing. Advanced	Ron White.
5.	College Writing Skills	John Langan.
6.	Project Management Body of Knowledge,	Project Management Institute (PMI) standards committee
7.	Software Project Management	S.A. Kelkar, A Concise Study, Prentice Hall of India.
8.	Global Climatic Change	Honghton and R A,
9.	Health Factors for College Students	Maude Lee & Heredge E T.