

SEMESTER II (B. Sc. IT)

0202163: MATHEMATICS II

Full Marks: 100

Functions Marks: 10

Introduction; Types: Composite Functions, Even and Odd Function, Inverse Function; Function of Computer Science

Mathematical Induction Marks: 7

Principle of Mathematical Induction; Induction Example

Recurrence Marks: 10

Introduction; Recurrence Relation; Solving; Linear Recurrence Relation

Relation Marks: 12

Introduction; Properties; Digraphs: Using Digraphs to Model Information; Cartesian Product

Set Theory Marks: 7

Introduction; Types of Set; Venn Diagrams; Set Operation

Boolean Algebra and Logic Gates Marks: 14

Introduction; Boolean Algebra; Basic Logical Operations (Logic Variables): NOT Operator (Inversion), AND Operator, OR Operator; Logic Gates: Universal Gates, Constructing Gates; Fundamentals of Boolean Algebra: Boolean Operators; Laws of Boolean Algebra: Commutative Laws, Associative Laws, Distributive Laws; Switches and Inverter; Boolean Algebra Rules

Graphs Marks: 12

Introduction; Terminologies; Representation; Uses; Some Important Graphs; Degree Sequence: Graphical Degree Sequence; Isomorphism in Graphs: Isomorphism by Using Adjacency Matrix; Applicability of Graphs

Connected and Disconnected Graphs Marks: 14

Connected and Disconnected Graph: Walk, Trail, Path, Cycle (Circuit); Connected Graph: Component, Cut vertex; Weight Graph: Dijkstra's Algorithm; Connectivity: Edge Connectivity, Vertex Connectivity, Degree of Graph

Logic Marks: 14

Introduction; Statement/Proposition; Truth Value; Venn Diagrams; Compound Statements and Logical Connectives; Truth Tables; Tautology, Contradiction and Contingency; Logical Equivalence; Negation of a Compound Statement; Some Standard Equivalent Statements in Logic; The Use of Logic in Circuits; Quantifiers

Reference Books:

1. Anil Nerode, Richard A. Shore, *Logic for Applications*, Mathematical Logic, Springer Textbooks, 2nd Edition, pp. 1-127.
2. Brualdi, R, *Introductory Combinatorics*, Prentice-Hall, 3rd Edition, 1999.

3. D. Fomin, S. Genkin, I. Itenberg, *Mathematical Circles (Russian Experience)*, AMS, 1996
4. V. K. Balakrishnan, *Introductory discrete mathematics*, Courier Dover Publications, 1996.
5. V. K. Balakrishnan, *Schaum's outline of theory and problems of graph theory*, McGraw-Hill Professional, 1997.
6. Veerarajan, *Discrete Mathematics, Recurrence Relations*, Tata McGraw-Hill, 2006, 7th Edition, pp.343.

0202171: DESIGN AND ANALYSIS OF ALGORITHMS

Full Marks: 100

Introduction and Analysis of Algorithms

Marks: 23

Introduction to Algorithms; The Classification; Expressing Algorithm: Format Convention for Formulation of Algorithms, Pseudo Code Convention for Designing Algorithm; Operators and Precedence; The RAM Model; Analysis of Algorithms; Approaches to Algorithms Design

Elementary Data Structures

Marks: 17

Introduction to Data Structures; Elementary Data Structures: Arrays, Stacks, Queues, Linked Lists, Trees, Graphs, Heaps and Heap Sort

Divide –And–Conquer Algorithms

Marks: 18

Introduction to Divide-and-Conquer Method; Binary Search; Minimum and Maximum; Merge Sort; Quick Sort; Selection Sort; Strassen's Matrix Multiplication

Greedy Algorithms

Marks: 19

Introduction; Fractional Knapsack Problem; Minimum Spanning Trees (MST): Prim's Algorithm, Kruskal's Algorithm; Single Source Shortest Path: Dijkstra's Algorithm; Optimal Storage on Tapes

Graph Algorithms

Marks: 23

Basic Tree Traversal Techniques; The Techniques of Code Optimisation; AND/OR Graphs; Game Trees; Graph Traversal Techniques: Breadth-First Search (BFS), Depth-First Search (DFS), Biconnected Components and DFS; Backtracking: Sum of Subsets Problem, Graph Colouring, Hamiltonian Cycles, The Eight Queens Problem

Reference Books:

1. Chang, S. K., 2003. *Data structures and algorithms*. World Scientific. Volume 13.
2. Cormen, T. H., 2001. *Introduction to algorithms*. MIT Press. 2nd ed.
3. Horowitz, E., Sahni, S., 1978. *Fundamentals of computer algorithms*. Computer Science Press. 11th ed.

0202166: TELECOMMUNICATION SYSTEMS

Full Marks: 100

Introduction to Modulation

Marks: 8

Introduction; Analog and Digital; Concept; Data Encoding Techniques; Modulation Index; Need

Amplitude Modulation

Marks: 10

Introduction; Modulation Index and Percentage of Modulation; Sidebands and the Frequency Domain; Amplitude Modulation Power; Single-Sideband Modulation

Single Sideband

Marks: 12

Introduction; SSB Modulation by DSBSC-AM and Filtering; Representing SSB Signals in Terms of Hilbert Transforms; Single Sideband Modulator Using a Hilbert Transform; SSB Demodulator Using a Hilbert Transform; Mathematical Analysis of SSB Modulation; Generation of SSB Signals; Coherent Demodulation of SSB Signals; Need for Pilot Tone; Vestigial Side Band (VSB) Modulation

Frequency Modulation

Marks: 11

Introduction; Frequency Modulation Theory; The Index; Percentage; Bandwidth; Noise and Frequency Modulation; Pre-emphasis and De-emphasis; Frequency Modulation Transmitter; Frequency Modulation Receiver; Frequency Modulation Detector; Demodulation

Phase Modulation

Marks: 10

Introduction; Binary Phase Shift Keying; Quadrature Phase Shift Keying; Differential Phase Shift Keying; DQPSK;

Pulse Modulation

Marks: 10

Introduction; Sampling Theorem; Pulse Modulator; Types of Pulse Modulation; Pulse Code Modulation

Television

Marks: 11

Introduction; Television Transmitter; Television Receiver; Receiver Controls; Composite Video Signals; Picture Transmission

Introduction to Digital Communication

Marks: 13

Introduction; Comparison Between Analog and Digital Communication; Amplitude Shift Keying; Frequency Shift Keying; Phase Shift Keying; Multiplexing

Introduction to Digital Communication

Marks: 15

Introduction; Benefits of Fiber; Basic Fiber Optic Transmission System; Transmission Windows; Optic Transmitters; Fiber Optic Sources; Analog versus Digital Signals; The Optical Fiber - Launching the Light; Types of Optical Fiber; Losses in Optical Fiber; Optical Fiber Bandwidth; Fiber Optic Cable Construction; Components of a Fiber Optic Cable; Optical Connectors; Designing a Fiber Optic System; Signal Distortion

Reference Books:

1. Abhishek Yadav (2009). *Digital Communication*. Firewall Media. Pages 188.

2. Amitabha Bhattacharya (2005). *Digital Communication*. Tata McGraw Hill. Pages 516.
3. Apurba Das (2010). *Digital Communication: Principles and System Modelling*. Springer. 246 Pages.
4. Asrar U.H. Sheikh (2003). *Wireless Communication: Theory and Techniques*. Springer. Pgs 776.
5. Harold P. E. Stern, Samy A. Mahmoud, Lee Elliott Stern (2004). *Communication systems: analysis and design, Volume 1*. Pearson Prentice Hall. Pages 530.
6. Ian Glover, Peter M. Grant (2004). *Digital Communications*. Prentice Hall. Pages 1000.
7. J. S. Chitode (2010). *Digital Communication*. Technical Publications. Pages 664.

0202164: PROFESSIONAL SKILL DEVELOPMENT

Full Marks: 100

Introduction to Business Communication

Marks: 8

Introduction; Definitions of Communication; Business Communication; Importance of Effective Communication; Benefits; Process; Components; Interpersonal Communication; Types; Communication Channels; Game for Improving Communication: Game for Improving Speaking Skills, Game for Improving Listening Skills, Game for Improving Writing Skills

Communication Barriers

Marks: 5

Introduction; Wrong Choice of Medium/Channel; Types of Communication Barriers: Physical or Mechanical Barriers, Semantic Language Barrier, Personal Barriers, Socio-Psychological Barriers; Remedies to Overcome Communication Problems

Non-verbal Communication

Marks: 6

Introduction; Definition; Mediums: Face and Eyes, Clothing, Touch, Distance, Time; Communicating with Appearance; Communicating with Body Language: Facial Expressions, Gestures, Postures, and Movements, Touch and Smell, Sound; Silence, Time, and Space: Silence, Time, Space

Seven C's of Effective Communication

Marks: 5

Introduction; Completeness; Conciseness; Consideration; Concreteness; Clarity; Courtesy; Correctness

Business Letters

Marks: 10

Introduction; Importance; Qualities of Good Business Letters; Format: Heading, Date, Reference Number, Inside Address, Salutation, Subject Heading, Body of the Letter (Content), Complimentary Close, Signature, Enclosures, Post Script; Types of Business Letters: Letter of Enquiry, Letter of Quotation, Letter of Order, Letter of Advice, Letters of Complaint, Circular Letters, Circular with a Tear-off Slip, Reply-paid Cards, Letters of Introduction, Personnel Letters; Sample Business Letters: Letter of Enquiry/Letter for Obtaining Price List, Reply to Letter of Enquiry/Letter for Obtaining Price List, Circular Letter, Letters of Trade Reference Circular Letter, Letter of Complaint Against Goods, Complaint against Railways, Lodging of Complaint with Postal Authorities, Dunning Letter, Final Letter after Three Reminders were Sent, Letter of Introduction, Letter of Agency, Letter for Opening a Current Account, Submission of Claim with Life Insurance Company, Appointment Letter for Opening a Current Account, Letter of Confirmation, Letter of Promotion, Letter of Appreciation

Time Saving Message Media Tools

Marks: 6

Introduction; Types of Social Media Tools; E-mail: Using E-mail, E-mail Writing Skills, E-mail Format Suggestions, E-mail Address Examples, E-mail Address Examples with Separators; Short Message Service (SMS); Chat and Business

Persuasive Requests, Sales Letters and Business Report Writing

Marks: 10

Persuasive Requests; Sales Letters: Principles of Writing Sales Letters, Planning Sales Letters to Individuals, Writing Sales Letters to Individuals, Writing Sales Letters to Dealers, Replies to Inquiries as Sales Letters, Writing a Sales Letter Series; Business Reports: Characteristics of a Good Report, Before Writing a Report, The Body of a Report; Types of Business Reports: Short or Informal Reports, Long or Formal Reports, Composing a Long Report

Business Messages and Memorandums

Marks: 12

Introduction; Writing Process; Preparing to Write Business Messages: Analysing and Anticipating, Adapting to Task and Audience, Developing Reader Benefits, Use Bias-Free Language, Use Courteous Language, Use Simple, Familiar Language, Adapting to Legal Responsibilities; Organising and Writing Business Message: Formal Research Methods, Informal Research and Idea Generation Methods, Using a Cluster Diagram to Generate Ideas, Organising Data, Organising Cluster Diagram Ideas into Sub clusters; Composing Effective Business Message: Creating Effective Sentences, Recognising Phrases and Clauses, Emphasising Important Ideas, Effective Paragraphs; Revising Business Message: Revising for Clarity, Conciseness, and Readability; Memorandums: Memorandum Identification, Viewing Memorandum Formality, Writing Memorandums, Warning Memo

Strategies for Successful Speaking and Listening

Marks: 10

Introduction; Speaking Skills; Preparing a Presentation: Achieving Clarity and Impact, Using Visuals, Arranging the Room, Tips and Techniques, Presentation Planning Checklist, Presentation, Delivery, Appearance, Visual Aids, Understanding Presentations Aspects, Making Technical Talk Interesting, Preparation, Research, Organising Your Materials, Delivering Your Presentation; Strategies for Successful Listening: The Listening Process, Types of Faulty Listening, Barriers to Listening, Why Barriers Succeed?, Techniques for Listening, Selection of Listening Mode, Concentration and Thinking, Symbol/Meaning/Manipulation, Effective Listening, Improving Listening Skills

Strategies for Business and Group Meetings

Marks: 8

Introduction; Types of Meetings: Informal Meetings, Suggested Solution Meetings, Problem-Solution Meetings; Agenda of Meetings; Preparation: Importance of Preparation; Running Effective Meetings; Managing a Meeting; Conducting a Meeting: Code of Conduct, Matching Method to Purpose, Support; Assessment after the Meeting; Issuing Minutes of Meeting

Negotiation Skills

Marks: 5

Negotiation Skills; Nature of Negotiation; P's of Negotiation; Negotiation Process: Planning, Briefing, Bidding, Bargaining, Settling, Rafting, Reviewing; Negotiation Skills; Negotiation Climate; Role of Communication in Negotiation; Behaviour of Negotiators; Third Party Negotiations; Decision Biases Hindering Negotiations

Technical Project Report

Marks: 10

Introduction: Steps in Report Writing; Anatomy of Report: Arrangement of Contents, Description of the work (to be divided into following chapters), Report Dimension and Binding Specifications, Paper and Typing Dimension, Pagination, Guard Sheets, Appendix I, Appendix II, Appendix III, Appendix IV, Appendix V, Appendix VI, Appendix VII, Appendix VIII

Basic Human Psychology and Value System

Marks: 10

Basic Human Psychology; Facts; Communication Psychology; Psychology of Listening; Internet Communication; Psychology of Individual Differences: Personality, Motivation, Intelligence, Self-esteem, Self-efficacy; Value System; Characteristics of Value Systems: Personal vs. Communal, Exceptions, Consistency, Idealised vs. Realised

Reference Books:

1. Mary Morris Heiberger and Julia Miller Vick (2001). *The Academic Job Search Handbook*. University of Pennsylvania Press. 3rd edition.
2. Mary Scannell (2010). *The Big Book of Conflict Resolution Games: Quick, Effective Activities to Improve Communication, Trust and Collaboration*. McGraw-Hill; 1st edition. 240 pages.
3. Murphy (2009). *The Appearance and Design of Stationery and Envelopes and Electronic Mail Special Timesaving Message Media*. Tata McGraw Hill Education Publication, 7th edition, 175 pages.
4. P. S. Perkins, Les Brown (2008). *The Art and Science of Communication: Tools for Effective Communication in the Workplace*. Wiley & Sons. 224 pages.
5. Robert Bolton, (1986). *People Skills: How to Assert Yourself to Listen Others, and Resolve Conflicts*. Touchstone. Later Printing Edition.
6. Ronald B. Adler, Lawrence B. Rosenfeld, Russell F. Proctor (2009). *Interplay: The Process of Interpersonal Communication*. Oxford University Press, USA. 11th Edition, 496 pages.
7. Sharon Gerson, Steven Gerson (2010). *Technical Communication: Process and Product*, Prentice Hall. 6th Edition, 672 pages.

0202170: COMPUTER GRAPHICS

Full Marks: 100

Introduction to Computer Graphics

Marks: 10

Introduction: Advantages, Applications, Classification; Lines; Line Segment; Vectors; Pixels and Frame Buffers; Vector Generation; Vector Generation/Digital Differential Analyser (DDA) Algorithm: 'C' Code for DDA Line Drawing Algorithm, Advantages of DDA Algorithm, Disadvantages of DDA Algorithm; Bresenham's Line Algorithm: 'C' Code for Bresenham's Line Drawing Algorithm; Circle and Ellipse Drawing Algorithms: Midpoint Circle Drawing Algorithm, Code for Midpoint Circle Drawing Algorithm; Display of Frame Buffer, Ellipse Drawing Algorithm, 'C' Code for Midpoint Ellipse Drawing Algorithm

Graphics Primitives

Marks: 15

Display Devices: Cathode Ray Tubes (CRT), Vector Scan/Random Scan Display, Raster Scan Display, Important Characteristics of Video Display Devices; Interactive Devices: The Keyboard, Mouse, Trackball, Joystick, Data Glove, Light Pen; Data Generating Devices; Primitive Operations: Syntax of Graphics Primitives, Lines and Polylines, Markers and Polymarkers, Polygons and Rectangles, Attributes, Line Attributes, Marker Attributes, Filled Primitives and Their Attributes, Filled Primitives, Fill Attributes, Pen Pattern for Outlines; Display File Structure; Display File Interpreter; Normalised Device Coordinates; Display Processor

Polygons

Marks: 11

Introduction; Types; Representation of Polygons; Entering Polygons; Polygon Filling: Seed Fill, Boundary Fill Algorithm / Edge Fill Algorithm, 'C' Code for Boundary Algorithm (8-Connected Region), Flood Fill Algorithm, Scan Line

Algorithm, 'C' Code for Scan Line Algorithm for Filling Polygon, Features of Scan Line Algorithm; Filling with Patterns; Scan Conversion

2D Transformations

Marks: 11

Matrices: Matrix Multiplication, Identity Matrix; Two Dimensional Transformations: Translation, Rotation, Scaling; Homogeneous Coordinates: Homogeneous Coordinates for Translation, Homogeneous Coordinates for Rotation, Homogeneous Coordinates for Scaling; Composition of 2D Transformations: Rotation About an Arbitrary Point

Windowing and Clipping

Marks: 10

Introduction; Viewing Transformation: Normalised Coordinates; Window to Viewport Coordinate Transformation; Workstation Transformation; Two Dimensional Viewing Functions; 2D Clipping: Point Clipping, Line Clipping; Cohen-Sutherland Subdivision Line Clipping Algorithm: 'C' Code for Sutherland and Cohen Subdivision Line Clipping Algorithm; Polygon Clipping; Sutherland-Hodgeman Polygon Clipping Algorithm: 'C' Code for Sutherland-Hodgeman Polygon Clipping Algorithm

3-D Transformations

Marks: 15

Introduction; 3-D Geometry; 3-D Primitive: Algorithm 1: 3-D Absolute Move, Algorithm 2: 3-D Relative Move, Algorithm 3: 3-D Absolute Line Drawing Routine, Algorithm 4: 3-D Relative Line Drawing Routine, Algorithm 5: Absolute Polygon Drawing Routine, Algorithm 6: 3-D Relative Polygon Drawing Routine; Techniques To Achieve Realism: Depth Cueing, Surface Rendering, Stereoscopic Views, Material Properties, Shadows; Three Dimensional Transformations: Translation, Scaling, Rotation, Reflection; Three Dimensional Viewing; Projections: Parallel Projection, Perspective Projection, Types of Parallel Projections, Orthographic Projection, Oblique Projection, Types of Perspective Projections

Hidden Surfaces and Lines

Marks: 8

Introduction: Object-Space Method, Image-Space Method; Z-Buffer Algorithm: Advantages, Disadvantages; Scan Line Algorithm; Warnock's Algorithm: Advantages; Hidden Line Methods; Binary Space Partition Trees (BSP): The Pseudo Code for Building a BSP Tree, The Pseudo Code for Displaying a BSP Tree

Light, Colour and Shading

Marks: 8

Introduction; Diffuse Illumination; Specular Reflection; Shading Algorithms: Constant-Intensity Shading; Transparency; Shadows; Ray-Tracing: Gloss, Translucency, Soft Shadows, Depth of Field, Motion Blur; Colour Tables

Curves, Fractals and Animation

Marks: 12

Introduction: Curve Generation, Problems in True-Curve Generation Approach; Interpolation; Spline Representation: Spline Specifications; Bezier Curves: Properties of Bezier Curve; B-Spline Curves: Properties of B-Spline Curve; Fractals: Classification of Fractals, Self Similar Fractals, Self Affine Fractals, Invariant Fractals; Fractal Lines; Fractal Surfaces

Reference Books:

1. Akenine-Moller, T., 2008. *Real-Time Rendering*. 3rd ed. A K Peters/CRC Press.
2. Bouweraerts, D., 2004. *Introduction to Computer Graphics – Design Professional*. 1st ed. Course Technology.
3. Foley, J. D., 1993. *Introduction to Computer Graphics*. Addison-Wesley Professional.
4. Giesecke, F. E., 2003. *Engineering Graphics*. 8th ed. Prentice Hall.
5. Hearn, D., 1994. *Computer Graphics*. 2nd ed. Prentice Hall.
6. Hearn, M. P., 1997. *Computer Graphics C Version*. 2nd ed. Prentice Hall Press.