S.E. Sem. IV [CMPN]

Analog & Digital Communication

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

Practical & Oral : 25 Marks

1. **Introduction :**
   Basics of communication systems, modulation and demodulation, analog and digital modulation, noise in communication system, various noise parameters.

2. **Analog Modulation and Demodulation :**
   Different types of analog modulation, amplitude modulators and demodulators, frequency modulators and demodulators, phase modulation and demodulation, amplitude modulation and frequency modulation receivers.

3. **Pulse Analog Modulation :**
   Sampling theorem for low-pass and band-pass filters, sampling technique principle generation, demodulation and spectrum, types of pulse analog modulation, generation and detection of pulse amplitude modulation (PAM), pulse width modulation (PWM) and pulse position modulation (PPM), principles of time division multiplexing (TDM) and frequency division multiplexing (FDM).

4. **Digital Modulation Techniques :**
   Discrete messages, concept of information, average information, information rate, shannon's theorem, channel capacity, capacity of Gaussian channel, pulse code modulation (PCM), delta modulation (DM), adaptive delta modulation (ADM) – transmission systems.

5. **Base Band Modulation :**
   PCM waveform types, M-array pulse modulation, base band signal receiver, detection of binary signals in Gaussian noise, inter symbol interference (ISI) and equalization.

6. **Bandpass Modulation and Demodulation :**
   Types of bandpass modulation, phase shift keying – BPSK, DPSK, DEPSK, QPSK, M – array PSK, amplitude shifting – BASK, QAM, frequency shift keying – BFSK, M – array, FSK.

7. **Channel Coding :**
   Types of error control, linear block codes, errors detection and correction capacity, cyclic codes, convolution codes

References :

1. "Electronic Communication Systems (fundamentals through advanced)" (*Wayne Tomasi*) Pearson Education, Fourth Edition – 2002.
2. "Analog and Digital Communication" (*K. Shamugam*) Wiley India.
3. "Electronic Communication Systems" (*Kennedy and Davis*) Tata McGraw Hill, third edition, 1995.
4. "Principles of Communication Systems" (*Taub Herbert and Scholling Donald L*) Tata McGraw Hill, third edition, 1999.
5. "Digital Communication (fundamentals and applications)" (*Sklar Bernard*) Pearson Education, second edition, 2001.
6. "Modern Communication Systems" (*Couch Leon W–II*) Prentice Hall of India, first edition, 1995.
7. "Communication Systems Engineering" (*Prokies, John G. Salehi Masoud*) Pearson Education, second edition, 1995.
8. "Digital Communications" (*Haykin Simon*) John Weily and Sons, first edition, 1998.
9. "Introduction to Analog and Digital Communication" (*Simon Haykin*) Wiley India.

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S.E. Sem. IV [CMPN]

Analysis of Algorithm & Design

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical & Oral : 25 Marks

1. **Introduction to analysis of algorithm :**
   Design and analysis fundamentals; Performance analysis space and time complexity; Growth of function – Big–Oh, Omega, theta notation; Mathematical background for algorithm analysis; Randomized and recursive algorithm.

2. **Divide and Conquer :**
   Genaral method, Binary search, finding the min and max; Merge sort analysis; Quick sort, performance measurement; Randomized version of quick sort and analysis; Partitioned algorithm selection sort, radix sort, efficiency considerations; Strassen's matrix multiplication.

3. **Greedy Method :**
   General method; Knapsack problem; Minimum cost spanning tree-kruskal and primal algo, performanance analysis; Single source shorted path; Job sequencing with deadlines; Optimal storage on tapes.

4. **Dynamic Programming :**
   The general method; Multistage graphs, all pair shortest paths, single source shortest paths; Optimal BST 0/1 knapsack; TSP, flow shop scheduling.

5. **Backtracking :**
   The general method; 8 queen problem sum of subsets; Graph coloring hamltonian cycles; Knapsack problem.

6. **Branch and Bound :**
   The method, LC search; 15 puzzle : An example; Bounding and FIFO branch and bound; LC branch and bound; 0/1 knapsck problem; TP efficiency considerations.

7. **Internet algorithm :**
   Strings and patterns matching algorithm; Tries; Text compression; Text similarity testing.

References :

1. "Fundamentals of Computer Algorithms" (*Ellis horowitz, Sarataj Sahani, S. Rajsekaran*) University press.
2. "Introduction to the Design and Analysis of Algorithms" (*Annay V. Levitin*) Pearson Education publication, Second Edition.
3. "Introduction to Algorithms" (*T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein*) 2nd Edition, MIT Press/McGraw Hill, 2001.
4. "Algorithm design foundation, analysis and internet examples" (*Michael Goodrich & Roberto Tamassia*) Second Edition, Wiley student Edition.
5. "Computer Algorithms " Introduction to Design and Analysis" (*S. Baase, S and A. Van Gelder*) 3rd edition. Addison Wesley, 2000.
6. "Algorithm : sequential, parallel and distributed" (*Kenneth berman, Jerome Paul*) Cengage Learning.
7. "Data Structure & Algorithm Analysis in C++" (*Mark Allen Weiss*) Third Edition, Pearson Education.

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S.E. Sem. IV [CMPN]

Applied Mathematics - IV

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

1. Matrices :

1.1 Brief revision of vectors over a real field, inner product, norm, Linear independence and orthogonality of vectors.

1.2 Characteristic polynomial, characteristic equation, characteristic roots and characteristic vectors of a square matrix, properties of characteristic roots and vectors of different types of matrices such as orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix, Diagonable matrix, Cayley Hamilton's theorem (without proof) Functions of a square matrix, Minimal polynomial and Derogatory matrix.

2. Complex variables :

2.1 Functions of complex variables, Analytic function, necessary and sufficient conditions for f(z) to be analytic (without proof)

2.2 Milne-Thomson method to determine analytic function f(z) when it's real or imaginary or its combination is given. Harmonic function, orthogonal trajectories.

2.3 Mapping : Conformal mapping, linear, bilinear mapping, cross ratio, fixed points and standard transformations such as Rotation and magnification, invertion and reflection, translation.

2.4 Line integral of a function of a complex variable, Cauchy's theorem for analytic function, Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's integral formula and deductions.

2.5 Singularities and poles:
Idea of Taylor's and Laurent's series development (without proof) for Residue.

2.6 Residue's theorem, application to evaluate real integrals of type.

$$\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta, \text{ and } \int_{-\infty}^{\infty} f(x)dx$$

3. Mathematical programming :

3.1 Linear optimization problem, standard and canonical form of LPP, basic and feasible solutions, primal simplex method (more than two variables)

3.2 Artificial variables, Big-M method (method of penalty)

3.3 Dual problem, duality principle Dual simplex method. degeneracy and alternative optima unbounded solution.

3.4 Nonlinear Programming, unconstrained optimization, problem with equality constraints Lagranges Multiplier method, Problem with inequality constraints Kuhn-Tucker conditions.

References :

1. Complex Variables (*Churchill*) Mc-Graw Hill
2. Elements of Applied mathematics (*P. N. & J. N. Wartikar*) Pune Vidarthi Gruha Prakashan.
3. Higher Engineering Mathematics (*Dr. B. S. Grewal*) Khanna Publication.
4. Advanced Engineering Mathematics (*E. kreyszing*) Wiley Eastern Limited.
5. Operations research (*Kantiswearup, Manmohan, P. K. Gupta*) S. Chand & Co.
6. Operations Research (*S. D. Sharma*) S. Chand & Co.
7. Matrices (*A. R. Vasishtha*) Krishna Prakashan.

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S.E. Sem. IV [CMPN]
Computer Graphics

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical & Oral : 25 Marks

1. **Basic concepts :**
   Introduction to computer graphics; Lines, line segments, vectors, pixels and frame buffers, vector generation; DDA and Bresenham line drawing algorithms; Mid point and Bresenham's circle drawing algorithms; Mid point ellipse drawing algorithim; Various styles of lines like thick lines; Character generation methods (i)Stroke principles, (ii) Bit map method; Display file structure Display file interpreter.

2. **Polygons :**
   Introduction; Representation of polygon; Entering Polygons in display file; Inside-outside test; Polygon filling methods :Boundary fill, Flood fill, Scan line polygon fill, Patterns filling.

   Transformations :
   Homogeneous coordinates; Translation; Scaling; Rotation; Rotation about an arbitrary point; Inverse transforms; Shear transforms; Reflections.

3. **Segments :**
   Introduction; Segment table; Operations segment : Creation, Closing, Deletion, Renaming, Visibility; Other display-file structures; Image transformations; Raster techniques.

   Windowing and clipping :
   Introduction; Viewing transforms; 2D line clipping : Cohen-sutherland line clipping, Midpoint subdivision algorithm, Liang-Barsky Line Clipping algorithm, Cyrus-Beck algorithm; Text clipping; Polygon clipping : Sutherland-Hodgman polygon clipping algorithm, Weiler-Arthorton polygon clipping, Liang barsky polygon clipping; Generalized clipping.

4. **3–D Transformations :**
   Introduction; 3–D geometry; 3–D display methods; 3–D object representation methods; 3–D transformations; Rotation about an arbitrary axis; Concept of parallel and perspective projections; 3–D clipping; 3–D viewing transformations.

5. **Hidden Surfaces and Lines :**
   Introduction; Back-face removal algorithm; Z buffers; Scan-line; Painter's algorithm; Warnock's algorithm; Hidden line methods.

   Light, Color and Shading :
   Introduction; Diffuse illumination; Point-source illumination; Specular reflection; shading algorithms; transparency; reflections; shadows; ray tracing; Colour models; rendering pipeline.

6. **Curves and fractals :**
   Introduction; Curve generation : B–Splines, Bezier curves; Surfaces : Bezier surfaces, B spline Surfaces; Fractals, fractal lines and surfaces.

   Animation :
   Devices for producing animation; Computer assisted animation; Real time animation; Frame-by-frame animation; Method for controlling animation (fully explicit control, procedural).

References :

1. "Computer Graphics" (*S. Harrington*) 2nd Edition, McGraw-Hil Publications, 1987 ISBN 0 – 07 – 100472 - 6.
2. "Computer Graphics Principles and Practice" (*J. Foley, Van Dam, S. Feiner, J. Hughes*) 2nd Edition, Pearson Education, 2003, ISBN 81– 7808 – 038 – 9
3. "Computer Graphics for Java Programming" (*Leen Ammeraal, KangZRang*) 2nd edition, Wiley India.
4. "Procedural Elements for Computer Graphics (*D. Rogers*) 2nd Edition, TATA Mc-Graw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4
5. "Computer Graphics – C Version" (*D. Hearn, M. Baker*) 2nd Edition, Pearson Education, 2002, ISBN 81 – 7808 – 794 – 4.
6. "Computer Graphics : Using OpenGL" (*F. Hill*) 2nd Edition, Pearson Education, 2003 ISBN 81 – 297 – 0181 – 2.
7. "Computer Graphics" (*Xiang, Plastock*) 2nd Edition, TATA Mc-Graw-Hill Publication, 2002, ISBN 0 – 07 – 049958 – 6

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S.E. Sem. IV [CMPN]

Database Management System

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical & Oral : 25 Marks

1. **Introduction Database Concepts :**
   Introduction to data processing. Overview of file systems. Drawbacks of file system, Concept of a database. Comparison of Database systems and file system. Data abstraction, 3-Layered Architecture and data independence. Data models, Database languages. Database users and administrators. Database system structure.

2. **Entity-Relationship Model :**
   Basic concepts; Constrains; Design issues, Entity-Relationship diagram; Strong-weak entity sets; Extended ER features; Mapping an ER schema to tables.

3. **Relation Model :**
   Concept of a relation; Notion of primary and secondary keys; Structure relation database; The relation algebra and extended algebra operations; Formation of queries, Modification of database, Views.

4. **SQL :**
   Background Basic structure; Set operations, Aggregate function. Null values; Nested queries. Views, complex queries, Database modification; DDL, embedded SQL, Stored procedures and functions.

5. **Integrity and Security :**
   Domain Constraints, Referential integrity; Assertions, Triggers; Security and Authorization Authorization in SQL.

6. **Relational – Database Design :**
   First Normal form, Pitfalls in relational – database design; Function dependencies. Armstrong Axioms; 2^{nd}, 3^{rd}, BCNF, and 4^{th} normal form; Decomposition. Desirable properties of decomposition; Overall database design process.

7. **File structure, Indexing and Hashing :**
   File organization, Organization of records in files. Data Dictionary storage; Basic Indexing concepts, Ordered Indices, B+ Tree and B Tree Index Files; Static Hashing, Dynamic hashing; Index Definition in SQL Multiple key access.

8. **Transactions :**
   Transaction concept, Transaction states; Implementation of atomicity and durability; Concurrent Executions, Serializability, Recoverability; Implementation of isolation, Transaction definition in SQL.

9. **Concurrency Control :**
   Lock-based protocols; Timestamp-based protocols; Validation-based protocols; Deadlock handing.

10. **Recovery System :**
    Failure Classification, Storage structure; Recovery and atomicity; Log based recovery, Shadow paging; Recovering with concurrent transactions; Buffer Management.

References :

1. "Database System Concepts" (*Korth, Slberchatz, Sudarshan*) 5th Edition, McGraw – Hill.
2. "Database Systems Design, Implementation and Management" (*Peter Rob and Carlos Coronel*) Thomson Learning, 5th Edition.
3. "Fundamentals of Database Systems" (*Elmasri and Navathe*) Fourth Edition, PEARSON Education.
4. "Introduction to Database Systems" (*C. J. Date, A. Kannan*) Eighth Edition, Addison Wesley.
5. "Introduction to Database Management" (*Mark L. Gillenson, Paulraj Ponniah*) Wiley
6. "Database Management Systems" (*Raghu Ramkrishnan and Johannes, Gehrke*) TMH.
7. SQL and PL/SQL for Oracle 10g. Black Book (*Dr. P. S. Deshpande*) Dreamtech Press.

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S.E. Sem. IV [CMPN]
Operating System

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical & Oral : 25 Marks

1. **Operating System Overview :**
   Operating system objectives and Functions. Evolution of Operating systems, Characteristics of Modern Operating Systems, Basic Concepts: Processes, Files, System calls, Shell, Layered structure v/s Monolithic Structure of Operating System. Introduction to distributed OS, RTOS, Mobile OS.

2. **Process and process scheduling :**
   Process description, PCB, Threads, Thread management; process and thread, Process scheduling : Types, comparative assessment of different scheduling algorithms.

3. **Process Concurrency :**
   Principles of Concurrency; Mutual Exclusion – Hardware approaches; Mutual Exclusion - software support, Semaphores; Monitors, Message Passing; Readers/Writers Problem.
   Deadlock and starvation: Principles of Deadlock, Deadlock Prevention; Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy; Dining Philosophers problem.

4. **Memory Management :**
   Memory management Requirements. Memory Partitioning; Virtual memory; Paging, Segmentation; Design and implementation issues in paging and segmentation; page replacement algorithms; page fault handling; working set model.

5. **I/O Management and Disk Scheduling :**
   I/O Devices. Organization of the I/O Function; Operating System Design Issues; I/O Buffering, Disk Scheduling and disk scheduling algorithms; RAID; Disk cache.

6. **File Management.**
   Overview; File Organization; File Directories; File Sharing; Record Blocking; Secondary Storage Management; UNIX File system.

7. **Case Studies :**
   Overview of Linux operating system, Process and thread management Scheduling, concurrency control mechanisms, Memory management and I/O management in Linux.
   Overview of Windows operating system: Process and thread management, Scheduling, concurrency control mechanisms, Memory management and I/O management in windows.

References :

1. "Operating Systems" (*William Stallings*) 4th Edition, Pearson Education.
2. "Operating Systems Principles" (*Silberschatz A., Galvin P., Gagne G.*) Willey
3. "Understanding Operating Systems" (*Flynn Ida M., McHoes A.M.*) 4th Edition, Thomson.
4. "Modern Operating Systems" (*Tammembaum*) PHI
5. "Operating System" (*Milan Milenkovic*) Tata McGraw Hill
6. 'The Design of the Unix Operating System" (*Maurice J. Bach*) Prentice Hall.

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