

**Syllabus for PGET for M. Tech. Computer Science & Engineering
and
M. Tech. Computer Science & Engineering (Information Security)**

Section-I: Mathematical Aspects of Computer Science (15x2=30 Marks)

Combinatorics: Permutations, combinations, counting, summation;

Theory of Probability: Axiomatic definition of Probability, conditional probability, Baye's Theorem, random variables, Functions of random variables. Expectation, Probability distributions: Binomial Poisson, Exponential and Normal distribution and their moment generating functions.

Discrete Mathematics: Sets, relations, functions, lattices, Boolean algebra, induction, recurrence relations. Groups, Subgroups, Homomorphisms, Normal and subnormal subgroups.

Linear Algebra: Review of matrices, Consistency of system of Linear equations. Vector spaces and subspace, linear independence and dependence of vectors, Basis and dimensions, Rank and nullity of a linear transformation, Eigen values and eigenvectors of a Matrix, diagonalization.

Optimization Techniques: Linear Programming: Graphical method, Simplex method, Duality Theory and Sensitivity Analysis. Transportation and Assignment Problem: Initial Basic Feasible Solutions of Balanced and Unbalanced Problems, Optimal Solutions. Network Analysis: Shortest Path problem, Minimum Spanning Tree Problem, Maximum Flow Problem, Minimum Cost Flow Problem.

Numerical Techniques: Number systems, Solution of non-linear equations, solution of system of linear equations, curve fitting, interpolation, numerical differentiation and integration, solutions of IVP.

Section II: Concepts of Computer Science (35x2=70 Marks)

Digital Electronics: Number Representation, binary arithmetic, Logic gates, Combinational circuits, Sequential circuits, memory devices.

Computer Organization: Machine instructions and addressing modes, ALU and data-paths, hardwired and micro-programmed control pipelining, memory interface, I/O interfaces, serial communication interface, parallel processing, memory management

Structured and object oriented programming concepts (with reference to "C/ C++"):

Program control, functions, recursion, scope, binding, parameter passing, pointers, array handling, structures and unions, file handling, concepts of Object Oriented Programming.

Data Structures: Notion of abstract data types, stacks, queues, linked lists, trees, heap, graphs, Tree and graph traversals, hashing, sorting, searching.

Theory of Computation: Regular languages and finite automata, context free languages and pushdown automata, Turing machines.

Compiler Design: Lexical analysis, parsing, syntax directed translation, runtime environment, code generation, linking.

Operating Systems: Definition and significance of OS, OS as resource manager, Classical concepts processes, concurrency, synchronization, deadlock, threads and inter-process communication, CPU scheduling, memory management, file systems, I/O systems, protection and security, DOS, UNIX and windows.

Database Management Systems: Relational model, ER diagram, relational algebra, database design, normalization, SQL, transactions management and concurrency control.

Computer Networks: OSI reference model, sliding window protocols, LAN technologies (Ethernet, Token ring), TCP/UDP, IP, Networking addresses, transmission medias, Networking devices-Hub, switches, gateways and routers.

Software Engineering: Basics of s/w engineering, Software Process models, software project planning and management, software testing and reliability.