Department of Computer Sciences

University of Kashmir

Entrance Examination Syllabus for M. Tech Degree Programme in Computer Science

***Note*:**

The main objective of this paper is to assess the computer science and engineering background knowledge of candidates who want to pursue M. Tech degree programme. There shall be sixty questions, each carrying one mark. Weightage to be given to each section is given within parenthesis. Paper setters are required to set the required number of multiple choice type questions with only one correct or most appropriate answer, separately for each section, giving uniform representation to the whole syllabus contained therein.

Unit 1 [4 Marks]

Verbal Ability: English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning and verbal deduction.

Unit 2 [4 Marks]

Numerical Ability: Numerical computation, numerical estimation, numerical reasoning and data interpretation.

Unit 3 [4 Marks]

Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions.

Unit 4

Linear Algebra: [4 Marks]

Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition.

Unit 5

Calculus: [4 Marks]

Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration.

Unit 6

Probability: [4 Marks]

Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

Unit 7

Digital Logic : **[4 Marks]**

Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Unit 8

Computer Organization and Architecture: **[4 Marks]**

Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Unit 9

Programming and Data Structures **[4 Marks]**

Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Unit 10

Algorithms : **[4 Marks]**

Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.

Unit 11

Theory of Computation : **[4 Marks]**

Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contex-free languages, pumping lemma. Turing machines and undecidability.

Unit12

Compiler Design: **[4 Marks]**

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.

Unit 13

Operating System : **[4 Marks]**

Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

Unit 14

Databases : **[4 Marks]**

ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Unit 15

Computer Networks: **[4 Marks]**

Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.