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| <b>CS</b> | <b>Computer Science and Information Technology</b> |
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| <b>Section 1:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Engineering Mathematics</b>                |
| <p><b>Discrete Mathematics:</b> Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Monoids, Groups. Graphs: connectivity, matching, colouring. Combinatorics: counting, recurrence relations, generating functions.</p> <p><b>Linear Algebra:</b> Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition.</p> <p><b>Calculus:</b> Limits, continuity and differentiability, Maxima and minima, Mean value theorem, Integration.</p> <p><b>Probability and Statistics:</b> Random variables, Uniform, normal, exponential, Poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.</p> |                                               |
| <b>Section 2:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Digital Logic</b>                          |
| <p>Boolean algebra and minimization – algebraic technique, Karnaugh map, tabular method. Design of combinational and sequential circuits. Number representation and arithmetic (fixed and floating point).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                               |
| <b>Section 3:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Computer Organization and Architecture</b> |
| <p>Instruction set and addressing modes. Design of arithmetic and logic unit (ALU). Design of control unit – hardwired and microprogrammed. Memory interfacing and hierarchy: performance, cache memory mapping. I/O interface (interrupt and DMA). Instruction pipelining, pipeline hazards.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |
| <b>Section 4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Programming and Data Structures</b>        |
| <p>Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                               |
| <b>Section 5:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Algorithms</b>                             |
| <p>Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph traversals, minimum spanning trees, shortest paths.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                               |
| <b>Section 6:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Theory of Computation</b>                  |
| <p>Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                               |
| <b>Section 7:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Compiler Design</b>                        |
| <p>Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Local optimisation, Data flow analyses: constant propagation, liveness analysis, common sub expression elimination.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                               |
| <b>Section 8:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Operating System</b>                       |
| <p>System calls, processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                               |

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| <b>Section 9:</b>                                                                                                                                                                                                                                                                                                                                                  | <b>Databases</b>         |
| 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.                                                                                                                                                                |                          |
| <b>Section 10:</b>                                                                                                                                                                                                                                                                                                                                                 | <b>Computer Networks</b> |
| Principles of Layering; Basics of switching (circuit, packet and virtual circuit) and performance metrics;<br><br>Data link layer: error detection, Medium Access Control, Ethernet; Distance vector and link state routing; IPv4 - Fragmentation, CIDR Notation, Network Address Translation; TCP- flow control and congestion control, socket API; DNS and HTTP. |                          |