Section 1: Engineering Mathematics

G1

Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Graphs: connectivity, coloring.

G2

Linear Algebra: Matrices, determinants, system of linear equations, eigenvalues and eigenvectors.

Probability and Statistics: Random variables, Normal and Uniform distribution

G3

Probability and Statistics: Exponential, Poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

Section 2: Digital Logic

G4

Boolean algebra. Combinational and sequential circuits.

G5

Minimization. Number representations and computer arithmetic (fixed and floating point).

Section 3: Computer Organization and Architecture

G6

Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining, pipeline hazards.

G7

Memory hierarchy: cache, main memory and secondary storage.

Section 4: Programming and Data Structures

G8

Programming in C (data types, loops, conditional statements, storage classes, functions and pointers).

G9

Recursion. Arrays, stacks, queues, linked lists.

G10

Trees, binary search trees, binary heaps, graphs.

Section 5: Algorithms

G11

Searching, sorting, hashing, Asymptotic time and space complexity, Divide-and-conquer technique

G12

Algorithm design techniques: greedy, dynamic programming, Graph traversals, minimum spanning trees, shortest paths

Section 6: Theory of Computation

G13

Regular expressions and finite automata, Context-free grammars and push-down automata.

G14

Regular and context-free languages, pumping lemma, Turing machines and undecidability.

Section 7: Compiler Design

G15

Lexical analysis, parsing, syntax-directed translation.

G16

Runtime environments, Intermediate code generation, Local optimization, common subexpression elimination

Section 8: Operating System

G17

System calls, processes, threads, inter-process communication, concurrency and synchronization.

G18

Deadlock, CPU and I/O scheduling. Memory management and virtual memory, File systems.

Section 9: Databases

G19

ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints.

G20

Normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Section 10: Computer Networks

G21

Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit-switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging;

G22

Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4, CIDR notation

G23

Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT); Transport layer: flow control and congestion control, UDP, TCP, sockets

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