**COMPUTER SCIENCE**

**SYLLABUS FOR OLYMPIAD**

**1. Digital Logic:**

Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates, arithmetic circuits, code converters, multiplexers, decoders; Sequential circuits: latches and flip‐flops, counters, shift‐registers; Data converters: 8-bit microprocessor (8085, programming, memory and I/O interfacing. Logic Families.

**2. Computer Organization and Architecture:**

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).

**3. Programming and Data Structures Algorithms:**

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

**4. Data Warehousing:**

Data Warehouse environment, architecture, methodology, analysis, design, Construction and administration

**5. Theory of Computation:**

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

**6. Compiler Design:**

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

**7. Operating System:**

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

**8. Database Management System:**

ER-model. Relational model: relational algebra, tuple calculus, Normalization - l NF, 2NF, 3NF, BCNF and 4NF SQL. Integrity constraints, File organization, indexing (e.g., B and B+ trees),Data dictionary, Database Concepts, Data Models, Centralized and Distributed Database, Security, Concurrency and Recovery in Centralized and Distributed Database Systems, Object Oriented Database Management Systems (Concepts, Composite objects, Integration with ROBMS applications),

**9. Computer Networks:**

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.

**10. Computer Graphics:**

Display systems, Input devices, 2D Geometry, Graphic operations, 3D Graphics, Animation, Graphic standard, Concepts, Storage Devices, Input Tools, Authoring Tools, Graphics Application, Files and Operations

**SUBJECT-WISE MARKS WEIGHTAGE**

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| **SUBJECT** | **WEIGHTAGE %** |
| Digital Logic | 12% |
| Computer Organization and Architecture | 10% |
| Programming and Data Structures Algorithms | 12% |
| Data Warehousing | 6% |
| Theory of Computation | 7% |
| Compiler Design | 9% |
| Operating System | 11% |
| Database Management System | 12% |
| Computer Networks | 12% |
| Computer Graphics | 9% |