

Syllabus for MS Comprehensive Viva

1. Subjects taken by the student as part of course work
2. Core subjects:
 - (i) Data Structures and Algorithms
 - (ii) Computer Organization and Architecture
 - (iii) Operating Systems
 - (iv) Database **OR** Computer Networks

[Details given below]

Data Structures and Algorithm

Abstract Data Type (ADT) – Stack, Queue, List, Set, String. Binary tree, traversal technique. Binary Search Tree. Balanced Binary Tree, Red-Black tree, B-trees. Searching, Linear search, binary search, hashing. Sorting, selection sort, insertion sort, heap sort, quick sort, merge sort. Time and space complexity of algorithms, asymptotic notation. Graphs, DFS, BFS, Connected components, spanning trees.

Computer Organization and Architecture

Block diagram, Register, Instruction set, addressing mode. Machine Cycle and instruction cycle. Number representation and computer arithmetic. ALU. Control and Data path, Data path components. Controller design. Memory – Static and dynamic RAM, cache memory – organization and access techniques, memory hierarchy. I/O – concept and handshaking, polled and interrupt driven, DMA transfer. I/O devices – disk, CD-ROM, printer. Concepts of pipelining. RISC and CISC architectures.

Operating Systems

Process states, context switching, threads. Interprocess communication – process synchronization, shared memory, critical section, semaphores – implementation. Deadlock. CPU scheduling – preemptive vs. non-preemptive, round-robin, shortest job first, multilevel queue, time sharing system. Memory management – contiguous vs. non-contiguous allocation, paging and segmentation, virtual memory. I/O management – device driver. File system – file attributes and operations, directory structure, unix file system, file descriptor, inode.

Database

ER model, relational models – mapping from ER model to relational model. Relational algebra – selection, projection, product, natural join, union and set difference. Data dependency and normalization. SQL. B tree and B+ tree. Indexing. Transactions – ACID properties. Types of locking.

Computer Networks

Transmission media. Data encoding. Multiplexing. Flow and error control. OSI and TCP/IP. Ethernet. Circuit and packet switching. Subnet. IP routing. TCP and UDP. Sliding window protocol. Congestion control. Socket programming. HUB, switch, bridge, router, proxy, firewall.