

Technical Quick Recall

Read this twice daily.

Data structures and algorithms

- FIFO = queue; LIFO = stack.
- BFS uses queue; shortest path in unweighted graph.
- DFS uses stack/recursion.
- Binary search requires sorted data.
- BST inorder traversal is sorted.
- Hash table average lookup $O(1)$, worst $O(n)$.
- Merge sort $O(n \log n)$, stable, extra $O(n)$.
- Quicksort average $O(n \log n)$, worst $O(n^2)$.
- Heap root is min/max; build heap $O(n)$.
- Dijkstra does not allow negative edges.

Operating systems

- Process has own address space; threads share process memory.
- Page fault = required page absent from RAM.
- Deadlock conditions: mutual exclusion, hold-and-wait, no preemption, circular wait.
- Round Robin uses time quantum.
- Aging prevents priority-scheduling starvation.
- Paging fixed-size; segmentation variable-size.

Networking

- Routing/IP = network layer; ports/TCP/UDP = transport layer; MAC/switch = data link.
- TCP reliable/ordered; UDP low-overhead/connectionless.
- DNS 53; HTTP 80; HTTPS 443; SSH 22; DHCP 67/68.
- ARP IP → MAC; DNS name → IP; DHCP gives IP configuration.
- $/27 = 32$ addresses, 30 traditional usable hosts.

Embedded

- Microcontroller integrates CPU, memory and I/O.
- ADC analog → digital; DAC digital → analog.
- Interrupt reacts to event; polling repeatedly checks.
- Watchdog protects from software hang.

- UART async; SPI synchronous/full duplex; I2C two-wire/addressed.
- Hard real-time deadline miss can be critical.

SDLC and QA

- Waterfall sequential; Agile iterative; DevOps integrates development and operations.
- Verification = product right; validation = right product.
- Unit → integration → system → acceptance.
- Regression checks old functions after change; retesting confirms a specific fix.
- Black-box: BVA/equivalence/decision table; white-box: statement/branch coverage.

[[09_Revision/Last_Hour_Cheat_Sheet|Last-hour cheat sheet]]