Core CS Fundamentals (OS, CN, DBMS, SDLC & Agile)

Section A – Operating System (OS) Concepts

#	Question	Short Answer
1	What is an Operating System?	Interface between user and hardware managing processes, memory, and files.
2	What are the main functions of OS?	Process management, Memory management, File system, I/O control, Security.
3	Difference between process and thread	Process = independent unit; Thread = lightweight subtask of a process.
4	What is a process control block (PCB)?	Data structure storing process info (PID, state, registers).
5	What is context switching?	Saving one process state and loading another — for multitasking.
6	Explain CPU scheduling algorithms	FCFS, SJF, Priority, Round Robin.
7	What is deadlock?	Two processes waiting indefinitely for each other's resource.
8	Conditions for deadlock	Mutual exclusion, Hold & wait, No preemption, Circular wait.
9	How to prevent deadlock?	Break any of the four conditions.
10	What is paging and segmentation?	Paging divides memory into fixed-size blocks; segmentation uses variable logical units.

Section B – Computer Networks (CN)

#	Question	Short Answer
11	What is computer networking?	Interconnection of devices to share data and resources.
12	OSI vs TCP/IP layers	OSI – 7 layers; TCP/IP – 4 layers (Application, Transport, Internet, Network Access).
13	What is IP address?	Unique identifier for devices (IPv4 – 32-bit, IPv6 – 128-bit).
14	What is DNS?	Domain Name System – resolves domain names to IP addresses.
15	Difference between TCP and UDP	TCP – reliable, connection-oriented; UDP – faster, connectionless.
16	What is HTTP?	HyperText Transfer Protocol – client-server communication (port 80).
17	HTTPS vs HTTP	HTTPS adds encryption using SSL/TLS (port 443).
18	What is REST API?	Architecture using HTTP methods (GET, POST, PUT, DELETE) for resource operations.
19	What are GET and POST differences?	GET sends data via URL; POST sends in body (secure).
20	Example of network layer protocol	IP, ICMP, ARP.

Section C – DBMS Theory

#	Question	Short Answer
21	What is DBMS?	Software to manage data using structured queries.
22	DBMS vs File System	DBMS offers security, concurrency, integrity; file system doesn't.
23	What is a transaction?	A logical unit of work ensuring ACID properties.
24	What are ACID properties?	Atomicity, Consistency, Isolation, Durability.
25	What is concurrency control?	Mechanism to handle simultaneous transactions safely.
26	What is normalization?	Organizing data to minimize redundancy.
27	What is denormalization?	Combining tables for faster read performance.
28	What is indexing?	Data structure to speed up retrieval.
29	What is a view?	Virtual table derived from query result.
30	What is difference between inner join and outer join?	Inner = common records; Outer = includes unmatched ones.

Section D – SDLC & Software Engineering Concepts

#	Question	Short Answer
31	What is SDLC?	Software Development Life Cycle – process of building software.
32	Stages of SDLC	Requirement → Design → Implementation → Testing → Deployment → Maintenance.
33	What is Waterfall model?	Sequential SDLC model – next stage starts after completion of previous.
34	Limitation of Waterfall	No feedback loop → inflexible to changes.
35	What is Agile methodology?	Iterative approach with small deliverables and client feedback.
36	Scrum roles	Product Owner, Scrum Master, Development Team.
37	What is a sprint?	Time-boxed development iteration (2–4 weeks).
38	What is DevOps?	Combines development + operations for continuous delivery.
39	What are Agile ceremonies?	Daily Stand-up, Sprint Planning, Sprint Review, Retrospective.
40	What is CI/CD?	Continuous Integration & Continuous Deployment pipeline.

Section E – Software Testing & Quality Assurance

#	Question	Short Answer
41	What is software testing?	Process of validating that software meets requirements.
42	Types of testing	Unit, Integration, System, Acceptance, Regression.
43	White-box vs Black-box testing	White-box → internal logic; Black-box → functionality only.
44	What is Unit Testing?	Testing smallest code unit (usually a function/class).
45	What is Integration Testing?	Testing interaction between modules.
46	What is Regression Testing?	Ensuring new changes don’t break existing features.
47	What is Automation Testing?	Using tools like Selenium, JUnit to execute tests automatically.
48	What is a Test Case?	Document specifying input, expected output, and result.
49	What is UAT?	User Acceptance Testing – validating business needs.
50	What is Defect Lifecycle?	New → Assigned → Fixed → Retested → Closed.

Section F – Agile + DevOps Integration

#	Question	Short Answer
51	What is Agile Manifesto?	Focus on individuals, collaboration, working software, customer response.
52	Agile vs Traditional SDLC	Agile = iterative & adaptive; SDLC = sequential.
53	What is version control system?	Tracks code changes (Git).
54	Git vs GitHub	Git = local VCS; GitHub = cloud hosting for repositories.
55	What is a branch in Git?	Isolated workspace for feature development.
56	Git merge vs rebase	Merge adds commit; Rebase integrates history.
57	What is Docker?	Containerization platform to isolate apps.
58	Jenkins purpose	Automate build/test/deploy.
59	Continuous Deployment vs Continuous Delivery	Deployment = automatic release; Delivery = manual trigger.
60	Why Agile preferred in IT?	Flexibility, faster delivery, customer collaboration.

Section G – Integration & Real Scenarios

#	Question	Answer / Hint
61	How OS and DBMS interact in applications?	OS manages resources; DBMS handles data persistence.
62	Why REST API over traditional communication?	Lightweight, stateless, scalable.
63	How Agile + DevOps improve project delivery?	Continuous testing, feedback & integration.
64	Example of concurrency problem in DBMS	Two users updating same record simultaneously.
65	How can network delay affect API performance?	Causes latency; optimize via caching or pagination.
66	Why use transactions in banking systems?	To ensure atomic fund transfer.
67	How does version control fit in Agile?	Enables collaboration and rollback safety.
68	What are microservices?	Independent deployable units connected via APIs.
69	How does caching help performance?	Reduces DB hits, faster response.
70	What is container orchestration?	Managing containers via tools like Kubernetes.