Semester: 3	Department of Computer Science and Engineering	AY: 2026-27
Course Code: 1BCS304	Course Name: Operating Systems	

Question Bank

Q.	Module-01	M	L	C
1.	Define an operating system. Explain the role of an operating system from the user's view and the system's view.	6	L2	CO1
2.	Explain the organization of a computer system with a neat diagram. Describe how interrupts are handled and the storage-device hierarchy.	8	L2	CO1
3.	Describe the architecture of single-processor, multiprocessor and clustered systems. Differentiate between asymmetric and symmetric multiprocessing.	8	L2	CO1
4.	Explain multiprogramming and time-sharing systems. How does the operating system use them to improve CPU utilization?	6	L2	CO1
5.	Explain dual-mode operation and the use of a timer. How do they protect the operating system from user programs?	6	L2	CO1
6.	Briefly describe the process-management, memory-management and storage-management activities of an operating system.	8	L2	CO1
7.	Describe the user-operating system interfaces: command-line interpreter, graphical user interface and touch-screen interface.	6	L2	CO1
8.	What are system calls? Explain the different types of system calls with suitable examples. Also describe how parameters are passed to the operating system.	10	L2	CO1
9.	What are system programs? List their categories. Explain the design goals of an operating system and the separation of mechanism and policy.	8	L2	CO1
10.	Compare the simple, layered, microkernel and modular approaches to operating-system structure with neat diagrams, stating the advantages and disadvantages of each.	10	L4	CO1
	Module-02			
11.	Define a process. Explain the states of a process with a state diagram and describe the contents of the Process Control Block (PCB).	8	L2	CO2
12.	Explain process-scheduling queues and the long-term, short-term and medium-term schedulers. What is a context switch?	8	L2	CO2
13.	Explain the operations of process creation and process termination. Illustrate with the fork(), exec() and wait() system calls.	8	L2	CO2
14.	Explain inter-process communication using shared memory and message passing. Compare the two models.	8	L2	CO2
15.	What is a thread? Explain the many-to-one, one-to-one and many-to-many multithreading models with diagrams.	8	L2	CO2

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16.	Discuss the threading issues: semantics of fork() and exec(), thread cancellation, signal handling, thread pools and thread-specific data.	8	L2	CO2
17.	Explain the scheduling criteria. Differentiate between preemptive and non-preemptive scheduling. Describe the FCFS, SJF, Priority and Round Robin algorithms with their merits and demerits.	10	L2	CO2
18.	Consider the processes P1 (arrival 0, burst 8), P2 (arrival 1, burst 4), P3 (arrival 2, burst 9) and P4 (arrival 3, burst 5). Draw the Gantt chart and compute the average waiting time and average turnaround time using preemptive SJF (SRTF) scheduling.	5	L3	CO3
19.	Consider the processes P1 (burst 24), P2 (burst 3), P3 (burst 6) and P4 (burst 10), all arriving at time 0. Draw the Gantt chart and compute the average waiting time and average turnaround time using Round Robin scheduling with a time quantum of 4 ms.	5	L3	CO3
20.	Explain thread scheduling (process-contention scope and system-contention scope) and the approaches to multiple-processor scheduling, including load balancing and processor affinity.	8	L2	CO2
	Module-03			
21.	Explain the critical-section problem and the three requirements a solution must satisfy. Describe Peterson's solution and show that it satisfies these requirements.	8	L2	CO2
22.	Explain synchronization hardware: the test_and_set() and compare_and_swap() instructions. Show how they can be used to provide mutual exclusion.	6	L2	CO2
23.	What is a semaphore? Explain the wait() and signal() operations, binary and counting semaphores, and the implementation of semaphores without busy waiting.	8	L2	CO2
24.	Write the semaphore-based solution to the bounded-buffer (producer-consumer) problem and explain how it works.	8	L3	CO3
25.	Write the semaphore-based solution to the readers-writers problem (first readers-writers problem) and explain its working.	8	L3	CO3
26.	Explain the dining-philosophers problem. Give a semaphore-based solution and discuss how deadlock can occur and how it can be avoided.	8	L3	CO3
27.	What is a deadlock? Explain the four necessary conditions for deadlock. Describe the resource-allocation graph and the methods for handling deadlocks.	8	L2	CO4
28.	Explain the methods of deadlock prevention by negating each of the four necessary conditions.	6	L2	CO4

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29.	A system has five processes P0 to P4 and three resource types A, B and C with Available = (3, 3, 2). Allocation: P0 (1,1,0), P1 (2,1,1), P2 (3,0,2), P3 (1,1,1), P4 (0,0,2). Maximum: P0 (7,5,3), P1 (3,2,2), P2 (9,0,2), P3 (2,2,2), P4 (4,3,3). Using the Banker's algorithm, find the Need matrix and check whether the system is in a safe state. Give a safe sequence if one exists.	5	L3	CO4
30.	Explain the deadlock-detection algorithm for multiple instances of each resource type. Describe the ways of recovering from a deadlock.	8	L2	CO4
	Module-04			
31.	Differentiate between logical and physical addresses. Explain address binding, the memory-management unit (MMU), and the role of base and limit registers in memory protection.	6	L2	CO4
32.	Explain swapping. Describe contiguous memory allocation with fixed and variable partitions and discuss internal and external fragmentation and compaction.	10	L2	CO4
33.	Given memory partitions of 100 KB, 500 KB, 200 KB, 300 KB and 600 KB (in order), place processes of size 212 KB, 417 KB, 112 KB and 426 KB using the First-fit, Best-fit and Worst-fit strategies. Which strategy uses memory most efficiently?	5	L3	CO4
34.	Explain paging with a neat diagram showing the paging hardware. Describe the role of the Translation Look-aside Buffer (TLB) and memory protection in paging.	8	L2	CO4
35.	A paging system uses a TLB with a hit ratio of 80%. A TLB search takes 20 ns and a main-memory access takes 100 ns. Calculate the effective memory-access time. How does it change if the hit ratio rises to 98%?	5	L3	CO4
36.	Explain the structure of the page table: hierarchical paging, hashed page tables and inverted page tables.	8	L2	CO4
37.	Explain segmentation with a neat diagram of the segmentation hardware. How does it differ from paging?	6	L4	CO4
38.	What is demand paging? Explain the steps in handling a page fault and derive the effective access time for a demand-paged memory.	8	L2	CO4
39.	For the reference string 3, 2, 1, 0, 3, 2, 4, 3, 2, 1, 0, 4 with 4 frames, find the number of page faults using FIFO and LRU page-replacement algorithms.	5	L3	CO4
40.	Explain copy-on-write, the allocation of frames (equal, proportional, global and local replacement) and the concept of thrashing along with the working-set model.	8	L2	CO4
	Module-05			
41.	Explain the file concept: file attributes, file operations, open-file tables and file types.	6	L2	CO5

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42.	Explain the file access methods: sequential access, direct access and other access methods built on them.	6	L2	CO5
43.	Explain the directory structures: single-level, two-level, tree-structured, acyclic-graph and general-graph directories with diagrams.	8	L2	CO5
44.	Explain file-system mounting and file sharing, including multiple users, remote file systems and consistency semantics.	6	L2	CO5
45.	Explain the layered file-system structure. Describe the on-disk and in-memory structures used to implement a file system, and the role of the virtual file system.	8	L2	CO5
46.	Explain the directory-implementation methods and the contiguous, linked and indexed file-allocation methods with their advantages and disadvantages.	10	L2	CO5
47.	Explain the free-space management techniques: bit vector, linked list, grouping and counting.	6	L2	CO5
48.	Explain the mass-storage structure: disk structure, disk attachment, and the FCFS, SSTF, SCAN, C-SCAN and LOOK disk-scheduling algorithms.	8	L2	CO5
49.	The disk request queue (cylinders) is 95, 180, 34, 119, 11, 123, 62, 64. The head is at cylinder 50 and moving towards higher cylinders on a disk with cylinders 0 to 199. Compute the total head movement for FCFS, SSTF and SCAN scheduling.	5	L3	CO5
50.	Explain disk management: disk formatting, the boot block, bad-block management and swap-space management.	8	L2	CO5

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***Note:**

1. All modules should contain a minimum of **10** questions each and the total number of questions must be **50**.
2. Questions can carry marks of 06, 07, 08, 09, 10 and for problems: 04 or 05.
3. Follow the RBTL as per the keywords used to frame the questions.
4. Maintain the Course Outcomes (COs) as per the syllabus.
5. M: Marks, L: RBTL, C:COs.