

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Bachelor of Technology (Computer Engineering) SEMESTER - 4 Summer 2025 (Regular)

Course :Bachelor of Technology (Computer Engineering) Branch : Engineering and Technology

Semester : SEMESTER - 4

Subject Code & Name: BTCOC402 - OPERATING SYSTEMS

Time : 3 Hours]

[Total Marks : 60

Instructions to the Students:

1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No.6
4. Use of non-programmable scientific calculators is allowed.
5. Assume suitable data wherever necessary and mention it clearly.

Q1. Objective type questions. (Compulsory Question)

12

1	What is the primary function of an operating system?			
	a. Provide security to user files	b. Manage system hardware and software resources	c. Compile user programs	d. Connect to the internet
2	Which of the following best defines a Real-Time Operating System (RTOS)?			
	a. It is used only for gaming applications.	b. It processes data as it comes in, without delay.	c. It supports only batch processing	d. It runs on cloud-based infrastructure.
3	In multithreading, what is the benefit of using threads instead of processes?			
	a. Threads use more memory than processes	b. Threads provide better GUI designs	c. Threads share memory space and thus are more efficient	d. Threads cannot run concurrently
4	Which CPU scheduling algorithm favours processes with the shortest burst time?			
	a. FCFS	b. Round Robin	c. SJF	d. Priority Scheduling
5	Which of the following is a classical problem of synchronization?			
	a. Dining Philosophers Problem	b. Round Robin Scheduling	c. Memory Compaction	d. File Access Protocol
6	What is a semaphore?			
	a. A hardware device	b. A variable used to control access to resources	c. A memory partition	d. A CPU scheduling unit
7	What is the result of a deadlock in a system?			
	a. Processes execute faster	b. All processes are terminated	c. No process can proceed	d. System reboots automatically
8	Internal fragmentation occurs in which memory allocation method?			
	a. Variable partition	b. Paging	c. Fixed partition	d. Segmentation
9	What does a page fault indicate?			
	a. CPU overheated	b. Page is present in memory	c. Page not found in memory	d. Segmentation error
10	Which of the following is a disk scheduling algorithm?			
	a. FIFO	b. LRU	c. SSTF	d. NRU

11	What does the directory structure in a file system represent?			
	a. Memory map of physical storage	b. CPU scheduling queue	c. Hierarchical organization of files	d. List of user accounts
12	Which of the following best explains Demand Paging?			
	a. Pages are loaded only when required	b. All pages are preloaded into memory	c. Pages are never replaced	d. Paging is disabled during execution

Q2. Solve the following.

- A) Identify the major components of an operating system and analyse the role of each component by giving appropriate examples. 6
- B) Define system calls and classify the different types of system calls based on their functionality, providing relevant examples for each type. 6

Q3. Solve the following.

- A) Describe various process states in an operating system and illustrate their transitions using a well-labelled process state diagram. 6
- B) Write the key criteria used to evaluate CPU scheduling performance. For the following set of processes, apply the Round Robin (RR) scheduling algorithm with a time quantum of 3 ms. Compute the average waiting time and average turnaround time for all processes. 6

Process	Arrival Time	Burst Time
P1	0 ms	7 ms
P2	1 ms	4 ms
P3	2 ms	5 ms
P4	3 ms	6 ms

Q4. Solve Any Two of the following.

- A) Illustrate the Critical Section Problem with a diagram and summarize the three requirements any solution must satisfy. 6
- B) Describe the concept of semaphores and differentiate between counting and binary semaphores. Demonstrate how semaphores can be applied to solve the Producer-Consumer problem. 6
- C) Differentiate between deadlock prevention and deadlock avoidance strategies using suitable conditions and evaluate which is better for real-time systems. 6

Q5. Solve Any Two of the following.

- A) Describe internal and external fragmentation. Compare how fixed and variable partitioning schemes contribute to these types of fragmentation. 6
- B) Given memory blocks of size 100 KB, 500 KB, 200 KB, and 300 KB, apply First Fit and Best Fit strategies to allocate processes of size 212 KB, 417 KB, and 112 KB and 180 KB. Show step-by-step allocation. 6
- C) A system uses FIFO page replacement. Given the page reference string: 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5, apply FIFO and find the number of page faults for 3 frames. 6

Q6. Solve Any Two of the following.

- A) Compare the three file allocation methods: contiguous, linked, and indexed. Highlight their pros and cons. 6
- B) Given a free space block list of 16 blocks, demonstrate how the bit vector and linked list methods manage free space allocation. 6
- C) Describe the structure and functions of a typical file system. How is the directory structure maintained? 6

*** End ***