Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May / June 2026

Date: 29- 05-2026 **Time:**09:30am – 12:30pm

School: SOCSE	**Program:** B.Tech-CSE,IST,CSI,COM,CSN,CAI,CCS,CIT,&CSG	
Course Code : CSE2269	**Course Name:** OPERATING SYSTEMS	
Semester: IV	**Max Marks**:100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**24**	**24**	**26**	**16**	**10**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M

1.	Define system calls. Name any two types of system calls.	**2 Marks**	**L1**	**CO1**
2.	Differentiate between kernel mode and user mode.	**2 Marks**	**L2**	**CO1**
3.	What is a process control block (PCB)? Mention its contents.	**2 Marks**	**L1**	**CO2**
4.	Explain the difference between preemptive and non-preemptive scheduling with one example each.	**2 Marks**	**L2**	**CO2**
5.	Differentiate between deadlock prevention and deadlock avoidance.	**2 Marks**	**L1**	**CO3**
6.	Explain how Peterson's solution ensures mutual exclusion in the critical section problem.	**2 Marks**	**L2**	**CO3**
7.	What is a resource allocation graph? How is it used to detect deadlocks?	**2 Marks**	**L2**	**CO3**
8.	Define swapping. Why is it used in memory management?	**2 Marks**	**L1**	**CO4**
9.	List any two advantages of using paging in memory management.	**2 Marks**	**L1**	**CO4**
10.	Differentiate between logical address and physical address with an example.	**2 Marks**	**L2**	**CO4**

Part B

Answer the Questions. **Total Marks 80M**

<table>
<tr><td>11.</td><td>a.</td><td>Explain the different types of system calls in an operating system. Illustrate with appropriate examples.</td><td>10 Marks</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Describe the structure of an operating system and discuss the advantages and disadvantages of different OS structures.</td><td>10 Marks</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td>12.</td><td>a.</td><td>A user runs a program that gets loaded into memory and then executed. Explain the roles of the loader and linker in this process. Illustrate with a scenario.</td><td>10 Marks</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Using a high-level example, demonstrate how a user-level application interacts with the operating system through system programs and system calls.</td><td>10 Marks</td><td>L2</td><td>CO1</td></tr>
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<table>
<tr><td>13.</td><td>a.</td><td>Explain the differences between processes and threads. Illustrate with examples how multithreading models (user-level, kernel-level, and hybrid) handle thread management and resource sharing.</td><td>10 Marks</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Given the following set of processes with their arrival and burst times, calculate the average waiting time and average turnaround time using First Come First Serve (FCFS) and Round Robin (Time Quantum = 3) scheduling algorithms.
<table>
<tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th></tr>
<tr><td>P1</td><td>0</td><td>5</td></tr>
<tr><td>P2</td><td>1</td><td>3</td></tr>
<tr><td>P3</td><td>2</td><td>8</td></tr>
<tr><td>P4</td><td>3</td><td>6</td></tr>
</table></td><td>10 Marks</td><td>L3</td><td>CO2</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td>14.</td><td>a.</td><td>Discuss various inter-process communication (IPC) mechanisms. How does message passing differ from shared memory? Provide advantages and disadvantages of each approach.</td><td>10 Marks</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Consider the following processes:
<table>
<tr><th>Process</th><th>Burst Time (ms)</th><th>Priority</th></tr>
<tr><td>P1</td><td>6</td><td>3</td></tr>
<tr><td>P2</td><td>2</td><td>1</td></tr>
<tr><td>P3</td><td>4</td><td>2</td></tr>
<tr><td>P4</td><td>8</td><td>4</td></tr>
</table>
All processes arrive at time 0.
a) Using Non-Preemptive Shortest Job First (SJF) scheduling, calculate the average waiting time and average turnaround time.b) Using Non-Preemptive Priority Scheduling (lower number = higher priority), calculate the average waiting time and average turnaround time.</td><td>10 Marks</td><td>L3</td><td>CO2</td></tr>
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15.	**a.**	Explain Peterson's solution for the critical-section problem. Discuss how it satisfies the three requirements: mutual exclusion, progress, and bounded waiting, with a suitable example.	**10 Marks**	**L2**	**CO3**
	b.	Differentiate between Deadlock Prevention and Deadlock Avoidance techniques. **Explain how each technique works, and illustrate with diagrams or examples**	**10 Marks**	**L2**	**CO3**
		Or			
16.	**a.**	Given a scenario with five processes and five resources, construct a resource allocation graph. From the graph: • Determine if a deadlock exists. • Justify your answer. Suggest a method to recover from the deadlock if detected.	**10 Marks**	**L2**	**CO3**
	b.	Implement a solution for the Readers-Writers problem using semaphores. Your solution should: • Ensure mutual exclusion for writers. • Allow multiple readers in the critical section if no writer is waiting. Clearly describe the logic used for semaphore initialization and operations.	**10 Marks**	**L2**	**CO3**

17.	**a.**	Explain the concept of logical and physical address space. How does the Memory Management Unit (MMU) facilitate the translation between them? Include a neat diagram of MMU with a suitable example.	**10 Marks**	**L2**	**CO4**
	b.	A system has a virtual memory of 64 pages, each of size 2 KB. The physical memory has 8 frames. A program generates the following page reference string: 3, 8, 6, 3, 2, 9, 6, 1, 8, 3. Apply the FIFO page replacement algorithm and calculate the number of page faults. Show all steps clearly.	**10 Marks**	**L2**	**CO4**
		Or			
18.	**a.**	Differentiate between contiguous and non-contiguous memory allocation techniques. Explain segmentation with a neat diagram and highlight how it helps in better memory management.	**10 Marks**	**L2**	**CO5**
	b.	What is virtual memory? Explain demand paging and the steps involved in handling a page fault.	**10 Marks**	**L2**	**CO5**