

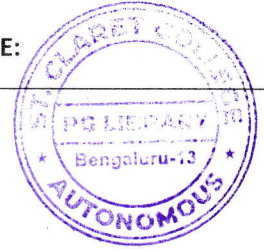
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St. Clare College

Autonomous, Bengaluru

ROLL NO:

DATE:



MCA END SEMESTER EXAMINATION-APRIL 2026

MCA: FIRST SEMESTER

MCA 1325: Operating Systems

TIME: 3 hours.

MAX. MARKS: 70

This paper contains TWO printed pages and FOUR parts

Instructions:

- 1. Verify and ensure that the question paper is completely printed.**
- 2. Any discrepancies or questions about the exam paper must be reported to the COE within 1 hour after the examination.**
- 3. Students must check the course title and course code before answering the questions.**

PART-A

Answer any EIGHT questions out of TEN. Each answer carries TWO marks. [2X8 = 16]

1. Briefly define a real-time operating system and name one example where it is used.
2. What is meant by the term kernel in an operating system?
3. State the role of system calls in an OS.
4. Explain why starvation occurs in process scheduling.
5. Describe the basic mechanism of how a spinlock works.
6. What is page fault, and how is it handled?
7. Name the three methods of allocating disk space for file systems.
8. Paraphrase the concept of virtualization in simple terms.
9. Draw a sample access matrix for a system with two processes and three files.
10. Classify OTPs based on generation methods

PART-B

Answer any FOUR questions out of SIX. Each answer carries FIVE marks. [5X4=20]

11. Summarize the role of inter-process communication and illustrate how two specific IPC methods operate.
12. Calculate average waiting and turnaround times by drawing the Gantt chart using FCFS and RR (q=2ms).

Processes	Arrival Time	Burst Time
P1	0	9
P2	1	4
P3	2	9
P4	3	5

13. Construct a scenario where the critical-section problem arises and justify the correctness of Peterson's Solution in that scenario.
14. What is paging? Explain paging with an example and diagram.

15. Apply the (i) FIFO and (ii) LRU replacement algorithms for the page-reference strings:
4, 2, 1, 7, 9, 8, 3, 5, 2, 6, 8, 1, 0, 7, 2, 4, 1, 3, 5, 8
Indicate the number of page faults for each algorithm, assuming demand paging with three frames.
16. Discuss the goals and principles of protection mechanisms in operating systems.

PART-C

Answer any TWO questions out of FOUR. Each answer TEN marks. [10X2=20]

17. Explain the services provided by an Operating System with examples.
18. A system has 5 processes P_0 through P_4 and 3 resource types:
A = 10 instances, B = 5 instances, C = 7 instances
At time T_0 , the system state is as follows:

	<u>Allocation</u>	<u>Max</u>	<u>Available</u>
	A B C	A B C	A B C
P_0	0 1 0	7 5 3	3 3 2
P_1	2 0 0	3 2 2	
P_2	3 0 2	9 0 2	
P_3	2 1 1	2 2 2	
P_4	0 0 2	4 3 3	

- Determine whether the system is in a safe state by applying the Banker's Safety Algorithm. If the system is safe, find and justify a safe sequence.
19. Given the following sequences 95,180,34,119,11,123,62,64 with the track 50 and ending track 199. What is the total disk travelled by the disk arm using FCFS, SSTF, LOOK, CLOOK and SCAN algorithm.
20. Describe the three types of traditional hypervisors.

PART-D

Answer the following question. Answer carries FORTEEN marks. [14X1=14]

21. Compare and analyze the architecture and design of UNIX, Linux, and Windows 10 operating systems.
