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Reg. No. | | | | | | | | |

I Semester M.C.A. Degree Examination, April/May - 2026

COMPUTER SCIENCE

Operating System Concepts and Design

(CBCS Scheme 2025)

Paper : MCA103T

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

1. ***Answer any Five questions from Part - A***
2. ***Answer any Four questions from Part - B***

PART - A

Answer any Five of the following questions. Each question carries 6 marks.(5×6=30)

1. What is Operating System? What are the roles of OS in Computer System?
2. Describe the primary goals of designing an Operating System.
3. Explain the concept of System Calls with the help of a suitable diagram.
4. Explain process states with a neat diagram.
5. What are Threads? Compare User-Level and Kernel - level threads.
6. Briefly explain the concept of paging.
7. Consider the given page references, calculate number of page faults occurred using FIFO Page Replacement Algorithm assuming 3 page frames.

   0, 1, 0, 2, 3, 0, 2, 4, 3, 3, 2, 0, 2, 1, 2, 7, 0, 1, 1, 0.
8. Explain different File allocation methods in detail.

PART - B

Answer any Four of the following questions. Each question carries 10 marks. (4×10=40)

9. a) Explain Linux Kernel Architecture in detail. **(5)**

   b) What is Containerization, and how does it differ from traditional Hypervisor based virtualization? **(5)**

[P.T.O.

10. a) Define deadlock. What are its necessary conditions? Explain. (5)

b) Differentiate between deadlock prevention and avoidance. (5)

11. Considering a system with five processes P_0 through P_4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t_0 following snapshot of the system has been taken:

Process	Allocation	Max	Available
	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	4 2 2	
P_4	0 0 2	5 3 3	

a) What will be the content of the need matrix?

b) Is the system in a safe state?

c) Determine the total amount of recourses of each type? (10)

12. a) Describe the types of fragmentation. How does it impact the performance of Operating System? (6)

b) Write a short note on Thrashing. (4)

13. a) Explain different file allocation methods in detail. (5)

b) Consider a disk queue with requests for I/O to blocks on cylinders is 82, 170, 43, 140, 24, 16, 190. The head is initially at cylinder number 50. The cylinders are numbered from 0 to 199. Using SCAN Algorithm find the total head movement (In number of cylinders) incurred while servicing these requests. (5)

14. Write a short note on:

a) Semaphores in Process synchronization. (5)

b) RAID (5)