

Master of Computer Applications
MCA105: Operating Systems
Unique paper Code: 223421108
Semester I
December 2024
Year of Admission: 2024

Time: *Three hours*

Maximum Marks: 70

NOTE: Question No. 1 is compulsory. Attempt any four from the rest of the questions. Answers should be brief and to the point and may be supplemented with neat Sketches, wherever required. Figures on the right-hand side margin indicate Max. Marks for each Question.

1. Answer all the parts, very briefly:

(2 X 7 = 14)

- (a) List the various criteria used to measure performance of a CPU scheduling algorithm?
- (b) What is Multilevel Paging?
- (c) Can Interrupt Disabling mechanism be used for enforcing mutual exclusion of critical sections in Multiprocessor Systems? Give reasons.
- (d) How is a Thread different from a Process?
- (e) What are the delay elements involved in Disk read/ write?
- (f) What are the necessary conditions for a deadlock to occur?
- (g) Can compaction be used with Compile Time and Load Time Address Binding? Give reasons.

2 (a) Compute the Average Waiting & Turnaround times for the following, if *Shortest Remaining Time First* Scheduling Algorithm is used: (7)

<u>Process</u>	<u>Arrival Time</u>	<u>Burst Time</u>	
P1	0	8	7
P2	1	4	0 65
P3	2	9	13
P4	3	5	

(b) Giving the notion of Process & Process states briefly explain the Process State transitions with the help of a neat diagram. (7)

3. (a) What is Critical Section? Explain the idea of Busy Form of Waiting for solving Mutual Exclusion Problem. (7)

(b) What is a Semaphore? Demonstrate how a semaphore based scheme can be used to solve finite buffer producer consumer problem. (7)

4. (a) Define the notion of Logical & Physical Addresses. How is Logical Address translated to Physical Address in Paging? Explain with a neat diagram. (7)

(b) Consider the following page reference string:

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 12

How many page faults will occur for the LRU page replacement algorithms, assuming availability of three frames? Does the page fault rate always decreases with increasing number of frames?

5. (a) A Computer System has 32-bit Virtual Address Space with a Page Size of 8 K and each page table entry of 4 Bytes. What will be number of pages in Virtual Address Space? What is the maximum size of addressable Physical Memory? (7)

(b) Distinguish between Deadlock Prevention & Deadlock Avoidance. How can a computing system recover from Deadlock, if one is known to exist? (7)

6. (a) Consider a disk queue with requests for I/O to blocks on following Cylinders: (7)

98, 183, 37, 122, 14, 124, 65, 67 236

in that order. If the head has just finished a request on cylinder 72 and is currently at cylinder 53, what will be the total head movement in serving all the requests, if SCAN scheduling algorithm is used?

(b) Consider a UNIX Inode having 15 pointers, out of which 12 are pointers to direct blocks and remaining to indirect blocks, with 13th for single indirection, 14th for double indirection & the 15th for triple indirection. Assume block size of 1 KB and each address of 2 Bytes. What can be the maximum size of a File? (7)

50 256MB