

MCA 2nd Semester Examination, 2025

MCA

(Operating System)

PAPER – MCA-202

Full Marks : 100

Time : 3 hours

Answer all questions

The figures in the right hand margin indicate marks

*Candidates are required to give their answers in
their own words as far as practicable*

GROUP—A

Answer any five questions : 2 × 5

- 1. What is the difference between a process and a thread ?**

(Turn Over)

2. What is a monolithic kernel ?
3. How is segmentation different from paging ?
4. What do you mean by pure demand paging ?
5. In a paging scheme, the logical address space is 128, physical address space of 256, and each page is of size 32 then find all pertinent information in paging scheme.
6. What is the difference between deadlock prevention and deadlock avoidance ?
7. Define a resource allocation graph (RAG).
8. What does the wait () and signal () operation do in semaphore terminology ?

(3)

GROUP-B

Answer any four questions : 15 × 4

9. Describe the layered approach to operating system design with architecture. Define batch processing and real-time operating system. Explain the concept of system calls. Describe how system calls provide an interface between user and kernel. $5 + 5 + 2 + 3$
10. Define thread. Explain the information associated with multithreading models. What are the advantages of using threads? Differentiate between user level and kernel level thread. Compare and contrast preemptive and non-preemptive scheduling. $2 + 3 + 3 + 3 + 4.$
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,

(4)

B has 7 instances and type C has 8 instances. Suppose at time t_0 following snapshot of the system has been taken :

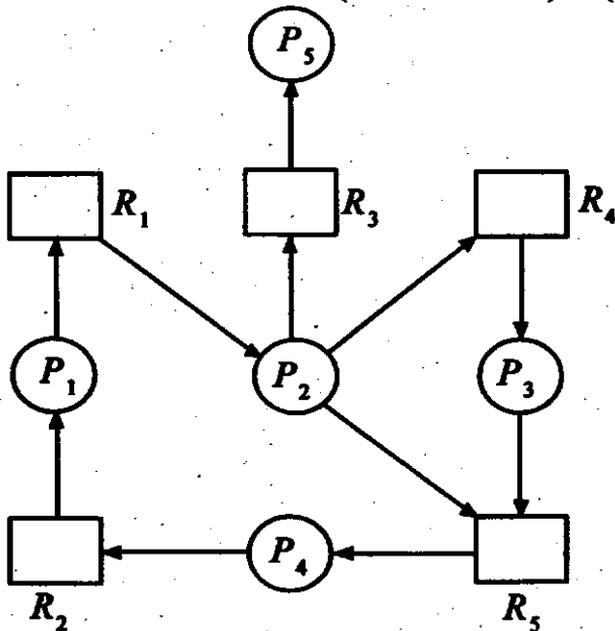
Processes	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	1	1	2	5	4	4	3	2	1
P1	2	1	2	4	3	3			
P2	3	0	1	9	1	3			
P3	0	2	0	8	6	4			
P4	1	1	2	2	2	3			

What will be the content of the Need matrix ?
Is the system in a safe state ? If Yes, then what is the safe sequence ? What will happen if process P1 requests one additional instance of resource type A and two instances of resource type C ?

(5)

Find the wait-for graph of the following resource allocation graph and detect whether deadlock occur or not.

(2 + 1 + 5 + 3) + (3 + 1)



12. Let's say the reference string is 041424342404142434 and we have 3

frames. Let's see how the algorithm proceeds by tracking the clock and second change page replacement algorithm.

Consider the following five processes each having its own unique burst time and arrival time.

Process	Queue	Burst time	Arrival time
P1		6	2
P2		2	5
P3		8	1
P4		3	0
P5		4	4

If the CPU scheduling policy is SJF pre-emptive and non-pre-emptive scheduling, calculate the difference average waiting time and average turn-around time in preemptive and non-preemptive versions.

$$(4 + 4) + 7$$

13. What is critical section problem ? Describe solutions to the problem. Discuss semaphores. How do they help in process synchronization ? Explain the Reader-Writer problem and describe how it can be solved using semaphores. $2 + 3 + 2 + 3 + 5$
14. What is thrashing in paging systems ? What is segmentation ? Explain logical to physical address translation in segmentation with an example and formula. What is the role of the Translation Lookaside Buffer (TLB) in paging ? $2 + 2 + 8 + 3$
15. Define seek and latency time. The disk queue has requests for I/O to the following tracks in this order : 98, 183, 37, 122, 14, 124, 65, 67. The disk head is initially at track 53. Calculate the total head movement for :

(8)

- FCFS
- SSTF
- SCAN (assume the head moves towards higher-numbered tracks first)
- C-SCAN(assume the head moves towards higher-numbered tracks first)

Show your calculations step-by-step.

$$3 + (3 \times 4)$$

[Internal Assessment – 30 Marks]
