

Total Pages—07

PG/2nd Sem/MCA-202/24

2 0 2 4

M.Sc. 2nd Semester Examination

MCA

PAPER : MCA-202

(Operating System)

Full Marks : 100

Time : 3 hours

The figures in the right-hand margin indicate marks.

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

Illustrate the answers wherever necessary.

Answer from **both** the Groups as directed.

GROUP—A

Answer *any five* questions :

2×5=10

1. What is convoy effect?
2. What do you mean by loosely coupled and tightly coupled system?
3. What is the key difference between a trap and an interrupt?
4. Compare between system call and an interrupt.

/982

(Turn Over)

(2)

5. Why is resource allocation graph necessary?
6. Define response time and throughput.
7. What is TLB?
8. What do you mean by page fault?

GROUP—B

Answer *any four* questions : 15×4=60

9. (a) Assume five processes are there. The job queue requires job sizes of 5K, 10K, 8K, 12K and 7K. The partition sizes are 13K, 11K, 5K, 9K and 8K respectively. Allocate the jobs using the first fit and best fit policy. Give neat diagram and find the allocated fragmentation area in each policy.
- (b) Design the hardware mapping from logical memory address to physical memory address using segmentation scheme with explanation.
- (c) Consider a paging system, it takes 10 ns to search translation look aside buffer (TLB) and 10 ms to access main memory. If the TLB hit ratio is 80%, then find the effective memory access time. 5+6+4

/982

(Continued)

(7)

- (c) What is semaphore and what are its operations?
- (d) Discuss producer-consumer problem with semaphore. 2+3+4+6
15. (a) Relate the term deadlock-avoidance, deadlock-prevention and deadlock detection algorithm.
- (b) Explain the wait-for-graph algorithm.
- (c) What do you mean by IPC?
- (d) Explain and differentiate between user level and kernel level thread.
- (e) What do mean by message passing? 4+4+2+2+3
16. Write short notes on the following : 3×5
 - (a) Belady's Anomaly
 - (b) Virtual memory
 - (c) Race condition
 - (d) Process-state-transition
 - (e) Dispatcher

[Internal Assessment : 30]

★ ★ ★

PG/2nd Sem/MCA-202/24

BL24/5(121)—100

(6)

4. P4 is holding two units of R3 and requesting for one unit of R1.

Determine which if any of the processes are deadlock in this state.

Consider the following snapshot

Process	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 5 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

Answer the following questions using banker's algorithm :

- (a) What are contents of matrix need?
- (b) Is the system in safe state?
- (c) If request for process P1 arrives for (0, 4, 2, 0). Can the request be granted immediately? 4+3+(1+4+3)

- 14. (a) What do you mean by critical section?
- (b) What are the necessary conditions for the solutions to the critical section problem?

(3)

10. (a) Consider following five processes P1 to P5. Each process has its unique priority, burst time and arrival time :

Process Id	Arrival time	Burst time	Priority
P1	0	4	2
P2	1	3	3
P3	2	1	4
P4	3	5	5
P5	4	2	5

If the CPU scheduling policy is priority preemptive scheduling, calculate the average waiting time and average turn-around time. (Higher number represents higher priority).

- (b) What is the difference between spooling and buffering?
- (c) Let's say the reference string is 0 4 1 4 2 4 3 4 2 4 0 4 1 4 2 4 3 4 and we have 3 frames. Let's see how the algorithm proceeds by tracking the clock page replacement algorithm. 7+3+5

(4)

11. (a) Consider the set of 5 processes whose arrival time and burst time are given below :

<i>Process Id</i>	<i>Arrival time</i>	<i>Burst time</i>
P1	0	5
P2	1	3
P3	2	1
P4	3	2
P5	4	3

If the CPU scheduling policy is Round Robin with time quantum = 2 unit, calculate the average waiting time and average turn-around time.

- (b) Distinguish between CPU bounded and I/O bounded processes.
- (c) What are the benefits of multithreaded programming?
- (d) Compare between user threads and kernel threads.
- (e) What are various scheduling criteria for CPU scheduling? 6+2+2+3+2

/982

(Continued)

(5)

12. (a) Compare between single contiguous allocation, fixed-partition and variable-partition multiprogramming.

(b) Define track and sector of a disk.

- (c) Consider with a request queue (0-199) of tracks 98, 183, 37, 122, 14, 124, 65, 67 and head pointer at 53. Find the total number of track movement in SSTF, SCAN (left-right) and LOOK (right-left) policy with proper diagram.

$$4+(1+1)+(3 \times 3)$$

13. What are the conditions for deadlock? A system has three types of resources R1, R2, R3 and their number of units are 3, 2, 2 respectively. Four processes P1, P2, P3, P4 are currently competing for these resources in following number :

1. P1 is holding one unit of R1 and is requesting for one unit of R2.
2. P2 is holding two units of R2 and is requesting for one unit each of R1 and R3.
3. P3 is holding one unit of R1 and is requesting for one unit of R2.

/982

(Turn Over)