

**OPERATING SYSTEM CONCEPT
(CBS2203)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) The address of the next instruction to be executed by the current process is provided by the _____
 - (a) CPU registers
 - (b) Program counter
 - (c) Process stack
 - (d) Pipe
- (ii) A process stack does not contain _____
 - (a) Function parameters
 - (b) Local variables
 - (c) Return addresses
 - (d) PID of child process
- (iii) Which of the following does not interrupt a running process?
 - (a) A device
 - (b) Timer
 - (c) Scheduler process
 - (d) Power failure
- (iv) A semaphore is a shared integer variable _____
 - (a) That cannot drop below zero
 - (b) That cannot be more than zero
 - (c) That cannot drop below one
 - (d) That cannot be more than one
- (v) Which one of the following is the deadlock avoidance algorithm?
 - (a) Banker's algorithm
 - (b) Round-robin algorithm
 - (c) Elevator algorithm
 - (d) FCFS algorithm

- (vi) The page table contains _____
 - (a) Base address of each page in physical memory
 - (b) Page offset
 - (c) Page size
 - (d) Segment Size
- (vii) A process is thrashing if _____
 - (a) It is spending more time paging than executing
 - (b) It is spending less time paging than executing
 - (c) Page fault occurs
 - (d) Swapping cannot take place
- (viii) The operating system stores an _____ in order to decide to which user to grant which access rights to which file?
 - (a) File allocation table
 - (b) Process control block
 - (c) Access control matrix
 - (d) File control matrix
- (ix) What are the various roles of protection?
 - (a) It is used to detect errors which can prevent contamination of system
 - (b) It is used to accelerate a process
 - (c) It is used to optimize system downtime
 - (d) None of the mentioned
- (x) Which of the following is major part of time taken when accessing data on the disk?
 - (a) Settle time
 - (b) Rotational latency
 - (c) Seek time
 - (d) Waiting time

Fill in the blanks with the correct word

- (xi) In FIFO page replacement algorithm, when a page must be replaced _____.
- (xii) In some requests of SSTF algorithm it may cause _____.
- (xiii) The dining-philosophers problem will occur in case of _____.
- (xiv) For most computers, the bootstrap is stored in _____.
- (xv) Access matrix model for user authentication contains _____.

Group - B

2. (a) Compare and contrast the different ways of thread implementation. [[CO2](Apply/IOCQ)]
- (b) Why medium term scheduler is required? Explain device queue with proper diagram. [[CO2](Apply/IOCQ)]
- (c) When CPU switches from process to process, explain in details what happens with proper diagram. Write the name of above technique? [[CO2](Apply/HOCQ)]

4 + 4 + 4 = 12

3. (a) What is a process? What information is contained in a PCB? *[[C02) (Remember/LOCQ)]*
 (b) Compare and contrast between Process and Thread. *[[C02) (Analyse/IOCQ)]*
 (c) Explain the benefits of multithreaded programming. Discuss different types of Multithreading Models. *[[C02)(Understand/LOCQ)]*
(1 + 3) + 3 + (2 + 3) = 12

Group - C

4. (a) Consider the set of 4 processes whose arrival time and burst time are given the below table -

Process Id	Arrival time	Burst time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

If the CPU scheduling policy is SJF (Both Preemptive and Non-Preemptive), then compare their average waiting time. *[[C03)(Apply/IOCQ)]*

- (b) Explain the Lamport's Bakery Algorithm for n process solution to the critical-section problem. How it is differ from Peterson's algorithm? *[[C03)(Analyse/IOCQ)]*
6 + 6 = 12

5. (a) Assume that there are 5 processes, P0 through P4, and 4 types of resources. At T0 we have the following system state:

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

What will be the content of the Need matrix? Is the system in a safe state? If yes, then what is the safe sequence? *[[C03) (Apply/IOCQ)]*

- (b) How the Dining Philosopher problem can be solved using semaphore? Explain the algorithm. *[[C03)(Analyze/IOCQ)]*
6 + 6 = 12

Group - D

6. (a) Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory. *[[C04)(Apply/IOCQ)]*

- (b) Consider the following page reference string:
5, 8, 4, 0, 2, 8, 4, 9, 6, 5, 6, 4, 5, 8
Assuming 4 frames are available, what is the page fault ratio for (i) FCFS (ii) MFU
(iii) LRU replacement algorithms?
[[CO4](Apply/IOCQ)]
6 + 6 = 12

7. (a) What is thrashing? What can the system do to eliminate this problem?
[[CO4](Analyse/IOCQ)]
(b) Suppose a disk drive has 400 cylinders, numbered 0 to 399. The driver is currently serving a request at cylinder 120 and previous request was at cylinder 140. The queue of pending request in FIFO order is:
86, 147, 312, 91, 177, 48, 309, 222, 175, 130
Starting from the current head position, what is the total distance in cylinders that disk arm moves to satisfy all pending request for each of the disk scheduling algorithm.
(i) SSTF (ii) SCAN (iii) C-SCAN.
[[CO5](Apply/IOCQ)]
6 + 6 = 12

Group - E

8. (a) What is Access Matrix? Why it is required, explain with an example.
[[CO6](Remember/LOCQ)]
(b) What is protection? Discuss the different types of password based authentication.
[[CO6](Remember/LOCQ)]
6 + 6 = 12
9. (a) Distinguish between a tree and an acyclic graph directory structure.
[[CO6](Apply/IOCQ)]
(b) What is the purpose of file-system mounting? What is mount point?
[[CO6](Remember/LOCQ)]
(c) What is a free-space list? How do we implement it?
[[CO6](Apply/IOCQ)]
4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	26.00	69.84	4.16