

**OPERATING SYSTEM CONCEPT
(CSBS 2201)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Which one of the following is not true?
 - (a) Kernel remains in the memory during the entire computer session
 - (b) Kernel is made of various modules which cannot be loaded in running operating system
 - (c) Kernel is the first part of the operating system to load into memory during booting
 - (d) Kernel is the program that constitutes the central core of the operating system.
 - (ii) In a timeshare operating system, when the time slot assigned to a process is completed, the process switches from the current state to?
 - (a) Suspended state
 - (b) Terminated state
 - (c) Ready state
 - (d) Blocked state.
 - (iii) A deadlock avoidance algorithm dynamically examines the _____ to ensure that a circular wait condition can never exist.
 - (a) operating system
 - (b) resources
 - (c) system storage state
 - (d) resource allocation state
 - (iv) Which one of the following is a synchronization tool?
 - (a) Thread
 - (b) Pipe
 - (c) Semaphore
 - (d) Socket.
 - (v) The strategy of making processes that are logically runnable to be temporarily suspended is called _____.
 - (a) Non preemptive scheduling
 - (b) Preemptive scheduling
 - (c) Shortest job first
 - (d) First come First served.
 - (vi) Which algorithm is defined in time quantum?
 - (a) Shortest job scheduling algorithm
 - (b) Round robin scheduling algorithm
 - (c) Priority scheduling algorithm
 - (d) Multilevel queue scheduling algorithm.

- (vii) Virtual memory can be implemented via _____
 (a) demand paging (b) logical paging
 (c) structural way (d) simple division
- (viii) "A process is busy swapping pages in and out", this situation is called _____
 (a) Thrashing (b) Compaction
 (c) External Fragmentation (d) Division.
- (ix) The time taken to move the disk arm to the desired cylinder is called the _____
 (a) positioning time (b) random access time
 (c) seek time (d) rotational latency.
- (x) LRU stands for
 (a) Least Recently Used (b) Less Recently Used
 (c) Least Recurrently Used (d) Least Randomly Used.

Group - B

2. (a) With proper example explain the difference between multiprogramming and multitasking. *[[C01](Understand/LOCQ)]*
 (b) Compare and contrast between zombie and orphan process with proper code example. *[[C02](Analyse/IOCQ)]*
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) 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](Analyse/IOCQ)]*
6 + 6 = 12

5. (a) Consider the set of 3 processes whose arrival time and burst time are given below:

Process Id	Arrival time	Burst time
P1	0	9
P2	1	4
P3	2	9

If the CPU scheduling policy is SRTF, calculate the average waiting time and average turnaround time. [[CO3](Apply/IOCQ)]

- (b) Show how counting semaphores can be implemented as binary semaphores. [[CO3](Analyse/IOCQ)]

- (c) What is critical section problem? How to solve critical section problem? [[CO3](Understand/LOCQ)]

$$6 + 2 + (2 + 2) = 12$$

Group - D

6. (a) Assume that the main memory has the following 5 fixed partitions with the following sizes: 100 KB, 500 KB, 200 KB, 300 KB and 600 KB (in order). How would each of the First-fit, Best-fit and Worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB and 426 KB (in order)? Compute the total memory size that is not used for each algorithm. Which algorithm makes the most efficient use of memory? [[CO4](Apply/IOCQ)]

- (b) Consider the following page reference string:

1, 2, 3, 4, 5, 6, 7, 8, 1, 2, 3, 4, 5, 6, 7, 8, 1, 2, 3, 4, 5, 6, 7, 8

Assuming 5 frames are available, what is the page fault ratio for

(i) FIFO

(ii) LRU

(iii) MFU page replacement algorithms?

[[CO4](Apply/IOCQ)]

$$6 + 6 = 12$$

7. (a) Compare and contrast between logical address space and physical address space. Why page table is required and also explain the content of page table. [[CO4](Analyse/IOCQ)]

- (b) Suppose a disk drive has 500 cylinders, numbered 0 to 499. The driver is currently serving a request at cylinder 320 and previous request was at cylinder 267. The queue of pending request in FIFO order is:

286, 476, 432, 365, 289, 198, 183, 243, 321, 397

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)]

$$(3 + 3) + 6 = 12$$

Group - E

8. (a) What is an ACL? What are its advantages? [[CO6](Remember/LOCQ)]
 (b) Discuss the file mapping on the disk using indirect blocks. [[CO6](Remember/LOCQ)]

- (c) What is token-based authentication? [[CO6](Remember/LOCQ)]
4 + 4 + 4 = 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
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<i>Cognition Level</i>	<i>LOCQ</i>	<i>IOCQ</i>	<i>HOCQ</i>
<i>Percentage distribution</i>	<i>34.37</i>	<i>65.63</i>	<i>0</i>

Course Outcome (CO):

- CSBS2201.1. Differentiate different types of operating systems (namely, batch, multi programmed, time-sharing, real-time, distributed, parallel processing system) based on their application domains and evolution.
- CSBS2201.2. Describe system operations, internal structure of computer system and operating system.
- CSBS2201.3. Illustrate multiprocessing and multithreading environments based on inter-process/thread communication and synchronization.
- CSBS2201.4. Compare the different level of memory (Primary memory, cache, virtual memory, secondary storage) and how they are correlated to improve the performance of the system.
- CSBS2201.5. Describe the operations of IO devices and how they are governed by the operating system
- CSBS2201.6. Define the activity and impact of threat, virus, worm and how the system could be protected from them.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*