

**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) What will happen when a process terminates?
 - (a) It is removed from all queues
 - (b) It is removed from all, but the job queue
 - (c) Its process control block is de-allocated
 - (d) All of these
- (ii) A Process Control Block (PCB) does not contain which of the following?
 - (a) Code
 - (b) Stack
 - (c) Bootstrap program
 - (d) Data
- (iii) What is the primary purpose of a multi-programmed operating system?
 - (a) To reduce memory usage
 - (b) To provide interactive user experience
 - (c) To keep the CPU busy at all times, maximizing utilization
 - (d) To work in a distributed environment
- (iv) When several processes access the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place is called _____.
 - (a) Dynamic condition
 - (b) Race condition
 - (c) Essential condition
 - (d) Critical condition
- (v) The bounded buffer problem is also known as _____.
 - (a) Readers – Writers Problem
 - (b) Dining – Philosophers Problem
 - (c) Producer – Consumer Problem
 - (d) Sleeping barber problem
- (vi) Which one of the following is the deadlock avoidance algorithm?
 - (a) Banker's algorithm
 - (b) Round-robin algorithm
 - (c) Elevator algorithm
 - (d) FCFS algorithm
- (vii) Any program, no matter how small, occupies an entire partition. This is called _____.
 - (a) Fragmentation
 - (b) Prior fragmentation
 - (c) Internal fragmentation
 - (d) External fragmentation

- (viii) If the size of logical address space is 2^m , and a page size is 2^n addressing units, then the high order ____ bits of a logical address designate the page number, and the ____ low order bits designate the page offset.
 (a) m, n (b) n, m
 (c) m – n, m (d) m – n, n
- (ix) In free space management, _____ method has negligible space overhead because there is no need for a disk allocation table, merely for a pointer to the beginning of the chain and the length of the first portion.
 (a) Bit tables (b) Chained Free Portions
 (c) Indexing (d) Free Block List
- (x) On systems where there are multiple operating system, the decision to load a particular one is done by _____.
 (a) boot loader (b) bootstrap
 (c) process control block (d) file control block

Fill in the blanks with the correct word

- (xi) A memory page containing a heavily used variable that was initialized very early and is in constant use is removed, then the page replacement algorithm used is _____
- (xii) A problem encountered in multitasking when a process is perpetually denied necessary resources is called _____.
- (xiii) The mounting of file system is _____.
- (xiv) Thread synchronization is required because _____.
- (xv) The VFS (virtual file system) activates file system specific operations to handle local requests according to their _____

Group - B

2. (a) What are the advantages and disadvantages of using multi-programming systems? [[CO1](Understand/LOCQ)]
 (b) What is degree of multiprogramming? What is fault tolerance? [[CO2](Understand/LOCQ)]
 (c) Describe the queueing diagram of process scheduling. [[CO2](Understand/LOCQ)]
4 + 4 + 4 = 12
3. (a) On a system with nCPUs, what is the maximum and minimum number of processes that can be in ready, run and blocked states? Justify your answer. [[CO2] (Evaluate/HOCQ)]
 (b) What resources are used when a thread is created? How do they differ from those when a process is created? Justify your answer. [[CO2] (Evaluate/HOCQ)]
 (c) Draw and explain modified process state diagram. Why is it introduced? [[CO2] (Analyze/IOCQ)]
(1 + 3) + (1 + 3) + (3 + 1) = 12

Group - C

4. (a) Consider a system with five processes P0 through P4 and three resource types A, B, and C. Resource type A has seven instances, resource type B has two instances, and resource type C has six instances. Suppose that, at time T0, we have the following resource-allocation state:

	Allocation	Request	Available
	A B C	A B C	A B C
P0	0 1 0	0 0 0	3 3 2
P1	2 0 0	2 0 2	
P2	3 0 3	0 0 0	
P3	2 1 1	1 0 0	
P4	0 0 2	0 0 2	

Check that the system is in a deadlocked state or not? Explain your answer

[[CO3](Apply/IOCQ)]

- (b) Define Mutual-exclusion implementation with swap() instruction. Explain with example.

[[CO3](Apply/IOCQ)]

6 + 6 = 12

5. (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	6
P2	1	1
P3	2	4
P4	3	3

If the CPU scheduling policy is SJF (Both Preemptive and Non-Preemptive), then compare their average waiting time.

[[CO3](Apply/IOCQ)]

- (b) Write down the solution of the Sleeping Barber Problem using semaphore.

[[CO3](Analyse/IOCQ)]

6 + 6 = 12

Group - D

6. (a) What are the differences between internal and external fragmentation? How can their occurrence be prevented or mitigated? Explain with example.

[[CO4](Analyse/IOCQ)]

- (b) Consider a disk queue with I/O requests on the following cylinders in their arriving order: 37, 56, 98, 32, 108, 78, 44, 78, 67, 69, 100

The disk head is assumed to be at Cylinder 40 and moving in the direction of decreasing number of cylinders. The disk consists of total 150 cylinders. Calculate and show with diagram the disk head movement using SSTF, SCAN, C-SCAN scheduling algorithms.

[[CO5](Apply/IOCQ)]

6 + 6 = 12

7. (a) "Sometime worst fit is better than best fit" –Justify your answer. [[CO4] (Evaluate/HOCQ)]
- (b) 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)]
- (c) Describe the LRU page replacement algorithm, assuming there are 3 frames and the page reference string is 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1. Find the number of page faults. [[CO4](Apply/IOCQ)]
- 2 + (2 + 2) + 6 = 12**

Group - E

8. (a) What is Super Block? Why it is required? [[CO6](Remember/LOCQ)]
- (b) Explain the different ways adapted for free space management in a disk. [[CO6](Remember/LOCQ)]
- 6 + 6 = 12**
9. (a) What is a C-list? What are its advantages? [[CO6] (Remember/LOCQ)]
- (b) Explain various types of FCB checks for file system inconsistencies. [[CO6] (Understand/LOCQ)]
- (c) What is biometric-based authentication? [[CO6](Understand/LOCQ)]
- 4 + 4 + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	37.51	52.08	10.41