



## Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)

Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC

Coimbatore - 641 043, Tamil Nadu, India

### Master's Degree Examination – May 2025

#### II Semester

**Class : I M.C.A.**  
**Major : Computer Applications**

**Time: 3 Hours**  
**Max. Marks: 100**

#### 23MCAC10 Operating Systems

##### Course Outcomes:

CO1: Analyze various process states and apply deadlock recovery measures.

CO2: Implement mutual exclusion primitives and process Synchronization.

CO3: Organize and manage storage efficiently.

CO4: Organize and manage processors effectively.

CO5: Implement operating system security, protection mechanisms and compare various operating systems.

#### Part A

10 x 1 = 10

#### Choose the Correct Answer

- In OS, \_\_\_\_\_ determines when and for how long a process executes on a processor. CO1K1
  - Memory Manager
  - I/O Manager
  - Process Scheduler
  - IPC Manager
- A process that has acquired an exclusive resource may hold that resource while the process waits to obtain other resources is called CO1K1
  - Mutual Exclusion
  - Hold and Wait
  - No-Preemption
  - Circular-Wait
- Mutual exclusion needs to be enforced only when threads access \_\_\_\_\_ modifiable data. CO2K1
  - Unshared
  - Shared
  - Unique
  - all the above
- Which operations can be implemented in the kernel by blocking waiting threads to avoid busy waiting? CO2K2
  - Binary
  - Semaphore
  - Mutex
  - Coupling
- The process of merging adjacent holes to make a single large hole is CO3K1
  - coalescing
  - compaction
  - burping
  - garbage collection
- Which of the following is the simplest page replacement algorithm? CO3K3
  - FIFO
  - Optimal page replacement
  - LRU replacement
  - Counting based replacement
- Which of the following scheduling algorithm is non-preemptive scheduling? CO4K1
  - SJF scheduling
  - Round-Robin scheduling
  - SRTF scheduling
  - None of the above
- The goal of \_\_\_\_\_ algorithm is to execute processes from the same job concurrently rather than maximize processor. CO4K2
  - co-scheduling
  - RRJob
  - SNPF
  - SPF
- The heads of the magnetic disk are attached to a \_\_\_\_\_ that moves all the heads as a unit. CO5K4
  - spindle
  - disk arm
  - track
  - assemblies
- A \_\_\_\_\_ is a centrally controlled, integrated collection of data. CO5K1
  - Audit
  - File
  - Disk
  - Database

**Part B** **5 x 6 = 30**  
**Answer ALL questions**  
**Each answer should not exceed 400 words or two pages**

- 11.a. With a sketch, explain process state transitions in OS. CO1K3  
(or)
- 11.b. Define Bankers algorithm and list down the properties exhibited by the OS in bankers algorithm to prevent deadlock. CO1K1
12. a. Discuss the applicability of implementing mutual exclusion primitives with blocking. CO2K1  
(or)
- 12.b. Outline producer / consumer relationship implemented with semaphores. CO2K3
- 13.a. Sketch and explain hierarchical memory organization. CO3K3  
(or)
- 13.b. Discuss the similarities and differences between paging and segmentation. CO3K3
- 14.b. Discuss about multiprocessor operating system organization. CO4K3  
(or)
- 14.b. Compare pre-emptive with non pre-emptive scheduling with illustrations. CO4K2
- 15.a. Write a note on SPTF and SATF scheduling. CO5K2  
(or)
- 15.b. List and state about various performance measures involved in measuring the efficiency of the computer system. CO5K3

**Part C** **5 x 12 = 60**  
**Answer ALL questions**  
**Each answer should not exceed 800 words or four pages**

- 16.a. In a block/wakeup mechanism, a process blocks itself to wait for an event to occur. Another process must detect that the event has occurred, and wake up the blocked process. It is possible for a process to block itself to wait for an event that will never occur.
- i. Can the operating system detect that a blocked process is waiting for an event that will never occur? (4 Marks) CO1K5
- ii. What reasonable safeguards might be built into an operating system to prevent processes from waiting indefinitely for an event? (8 Marks) CO1K4  
(or)
- 16.b. A system has three processes and four identical resources. Each process requires at most two of the resources at any given time.
- i. Can deadlock occur in this system? Explain. (4 Marks) CO1K5
- ii. Write a note on deadlock detection and recovery. (8 Marks)
- 17.a. When two threads simultaneously attempt enterMutualExclusion(), we have assumed that the "winner" is selected at random. Discuss the ramifications of this assumption. Give a better method. Discuss how such a method might be implemented on a multiprocessor system where several threads could in fact attempt enterMutualExclusion() at precisely the same moment. CO2K2  
(or)
- 17.b. Explain how to implement binary semaphore with a counting semaphore. CO2K3
- 18.a. Write a note on storage management strategies. CO3K3  
(or)
- 18.b. Sketch and explain virtual address translation with block mapping. CO3K4

19.a. Which level of scheduler should make a decision on each of the following questions?  
Justify your answer. (Each subdivision carries 4 Marks) CO4K5

- i. Which ready process should be assigned a processor when one becomes available?
- ii. Which of a series of waiting batch processes that have been spooled to disk should next be initiated?
- iii. Which processes should be temporarily suspended to relieve a short-term burden on the processor.

(or)

19.b. Write a detailed note on any four scheduling algorithms with appropriate diagrams CO4K3

20. a. Discuss in detail about various performance evaluation techniques of a system. CO5K2

(or)

20.b. In what type of environment are access control lists more appropriate than access control matrices? Elaborate on access control. CO5K4

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