



**VIT**  
Vellore Institute of Technology  
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

SLOT: C2

**SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**  
**CONTINUOUS ASSESSMENT TEST - I**  
**FALL SEMESTER 2025-2026**

Programme Name & Branch : B.Tech & CSE(BBS)  
Course Code and Course Name : CBS1006 - Principles of Operating Systems  
Faculty Name(s) : Dr. Yoganand S. and Dr. Priyadharsini M.  
Class Number(s) : VL2025260103276, VL2025260103273  
Date of Examination : 19.08.2025  
Exam Duration : 90 minutes  
Maximum Marks: 50

**General instruction(s):**

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes:
  1. Describe the various OS functionalities, structures and layers.
  2. Usage of system calls related to OS management and interpreting different stages of various process states
  3. Design CPU scheduling algorithms to meet and validate the scheduling criteria.
  4. Apply and explore the communication between inter process and synchronization techniques

| Q. No | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | M          | CO | BL |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|----|
| 1.    | a. Discuss the history of the operating system with respect to its name, process, key features and examples.<br><br>b. List out the various services provided by the operating system and highlight the important service in it.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5<br><br>5 | 1  | 1  |
| 2.    | Define system call and explain the steps for handling a system call by an operating system (6)<br>Write the appropriate system call for the following descriptions. (4)<br>a. Create a child process<br>b. Makes the parent process wait for a child process to terminate.<br>c. Attaches a file system to the directory tree.<br>d. Suspends execution for a specified interval.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10         | 2  | 3  |
| 3.    | Consider a single-processor operating system (OS) running on a desktop computer. At a particular moment, the CPU is executing Process A (a video rendering application). Suddenly, an interrupt occurs because Process B (a web browser) completes a network I/O operation (e.g., downloading a large file) and becomes ready to run. The OS's scheduler decides to pre-empt Process A and allow Process B to run. For the given scenario answer the following questions.<br>a. When the interrupt from Process B occurs, what specific information from Process A's Process Control Block (PCB) must the operating system save?<br>b. What specific information from Process B's PCB must the operating system load into the CPU registers?<br>c. Draw the block diagram of PCB<br>d. Identify where the context switching happens?<br>e. Identify at least two types of overhead associated with context switching. | 10         |    |    |



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4. Consider the following set of four processes. Their arrival time and time required to complete the execution are given in following table. Consider all time values in milliseconds. Use the following criteria to evaluate the turnaround time and waiting time for each process with its average.

| Process | Arrival Time | (CPU Burst Time) |
|---------|--------------|------------------|
| P0      | 0            | 10               |
| P1      | 1            | 6                |
| P2      | 3            | 2                |
| P3      | 5            | 4                |

- a. **Selection Criteria:** The process, that requires shortest time to complete execution, is served first.  
**Decision Mode:** Non pre-emptive: Once a process is selected, it runs until either it is blocked for an I/O or some event, or it is terminated. (5)
- b. **Selection Criteria:** Each selected process is assigned a time interval of 1ms, called time quantum or time slice. Process is allowed to run only for this time interval.  
**Decision Mode:** pre-emptive (5)

5. Imagine a barbershop with the following setup:

- **One Barber:** The barber is the resource that provides the service (cutting hair).
- **One Barber Chair:** Where the customer sits to get a haircut.
- **'N' Waiting Chairs:** A fixed number of chairs in the waiting room for customers who arrive when the barber is busy.

The rules governing the barbershop's operation are:

1. **If there are no customers:** The barber falls asleep in their chair.
2. **When a customer arrives:**
  - If the barber is asleep, the customer wakes the barber up and gets a haircut.
  - If the barber is busy, the customer checks the waiting room.
    - If there's an empty waiting chair, the customer sits down and waits.
    - If all waiting chairs are occupied, the customer leaves (as there's no space to wait).
3. **When the barber finishes a haircut:**
  - The barber dismisses the current customer.
  - The barber then checks the waiting room.
  - If there are customers waiting, the barber wakes up the next customer in line and starts cutting their hair.
  - If there are no customers waiting, the barber goes back to sleep.

The Challenge here is Synchronization Issues, Use necessary semaphore variable with the pseudocode to solve this problem?

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