VIT

Vellore Institute of Technology

REG.NO.:

SLOT: G2+TG2

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2025-2026

Programme Name & Branch	: B.Tech. CSE
Course Code and Course Name	: BACSE106 – Operating Systems
Faculty Name(s)	: Vijayasherly V, Vijaya Kumar K, Sivakumar N, Deepa K, Suresh P, Mohankumar B, Berlin M A, Ezhil Arasi V, Naga Priyadarsini R, Bhawana Tyagi, Raghul J, Saraswathi U, Sivakumar T, Arthi M, Nagaraja Rao A, Satyajit Mohanty Karthika M S
Class Number(s)	: 1587, 1562, 1566, 1576, 2404, 1586, 1570, 6373, 1589, 1591, 1596, 1602, 1617, 1611, 1567, 1635, 1593
Date of Examination	: 23.03.2026
Exam Duration	: 90 minutes – Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level
- Course Outcomes
  - CO2: Apply process scheduling algorithms and analyze thread models and deadlock-handling methods.
  - CO3: Implement synchronization mechanisms and solve concurrency problems in multi-process systems.
  - CO4: Evaluate memory management and file system strategies used in operating systems.

Q. No.	Question	Module	Marks	CO	BL
1.	Consider the following resource allocation matrix.	2	10	CO2	BL3

	Allocation						*Request*					
	R_1	R_2	R_3	R_4	R_5	R_6	R_1	R_2	R_3	R_4	R_5	R_6
P_1	1	0	0	0	1	0	0	0	0	1	0	0
P_2	1	0	0	1	0	0	0	1	0	0	0	0
P_3	0	0	0	0	0	1	0	0	0	1	0	0
P_4	0	1	0	1	0	0	0	0	0	0	0	1
P_5	0	0	1	0	0	1	0	0	0	0	0	0

Assume the total available resources are R_1=2, R_2=1, R_3=2, R_4=2, R_5=1, R_6=2.

Solve the following problems:

i. Draw the RAG and Calculate the need and available matrix. [3 Marks]
ii. Show the step-by-step execution of suitable deadlock avoidance algorithm. [5 Marks]
iii. Identify the process execution safe sequence to avoid deadlock. [2 Marks]

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2.	A hospital has one operating theatre that can be used for either emergency surgeries or scheduled surgeries, but not both at the same time. Conditions: 1. Only one surgery can use the theatre at a time. 2. Emergency cases must be given priority over scheduled ones. 3. Scheduled surgeries should not starve when no emergencies are waiting. Write a synchronization algorithm using semaphores and mutex locks to control access to the operating theatre while satisfying the above conditions.	3	10	CO3	BL2
3.	Two threads in an online ticket booking system update a shared variable tickets_sold. Each thread increments the counter 10,000 times. During testing, the final value is often incorrect due to concurrent updates. The use of semaphores, mutex locks, monitors, or hardware atomic instructions are not allowed. Use only shared variables and software logic. i. Identify the synchronization problem that causes the incorrect counter value. [2 Marks] ii. Develop pseudocode for a process coordination method that prevents simultaneous access to a shared resource. [5 Marks] iii. Use the given solution to explain how mutual exclusion, progress, and bounded waiting are achieved. [3 Marks]	3	10	CO3	BL3
4.	Given the following memory partitions (in KB) arranged in order: 120 K, 350 K, 600 K, 200 K, 450 K, 700 K, 180 K, 500 K, 320 K, 260 K. A set of processes (in KB) arrive in the following order: 115 K, 420 K, 180 K, 610 K, 90 K, 300 K, 275 K, 510 K, 140 K, 350 K (in order). Solve the following with three memory allocation schemes: i. Show the step-by-step allocation and identify which partition is assigned to each process. [7 Marks] ii. Which partitions remain unallocated? Justify the reason. [3 Marks]	4	10	CO4	BL3
5.	i. A process runs two batches uses a TLB-supported paging system: first 120 accesses with 70% TLB hit ratio and next 80 accesses with 85% TLB hit ratio. Hit time is 6 ms and miss time is 36 ms. Compute overall time and average access time. [5 Marks] ii.A lab server runs multiple student programs stored in separate segments. **Segment / Base / Length** A / 100 / 200 B / 400 / 500 C / 1000 / 300 D / 1500 / 250 E / 1900 / 150 Logical addresses: (A, 199), (C, 100), (D, 260), (E, 120) Identify valid/invalid addresses and draw the memory map. [5 Marks]	4	10	CO4	BL3

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