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

Reg. Number:	

Continuous Assessment Test (CAT) – I AUGUST 2025

Programme	:	B.Tech (CSE and itsSpecialization)	Semester	:	Fall 2025-26
Course Code & Course Title	:	BCSE303L - Operating System	Class Number	:	CH2025260101392 CH2025260101440 CH2025260101496 CH2025260101724 CH2025260102022 CH2025260102024 CH2025260102025
Faculty	:	Dr.Manju G Dr.Revathi M Dr. Sangeetha N Dr Monica K M Dr. Rajesh R Dr. Nivethitha V Dr. Anitha X	Slot	:	F2+TF2
Duration	:	1½ Hours	Max. Mark		50

General Instructions: < Use this space to provide additional information such as graph sheet, data book etc.>

- Write only your registration number on the question paper in the box provided and do not write other information
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level
1.		Consider that you are a system engineer in an Automobile company. You are involved in a project for developing an OS for an Electric Vehicle. The OS must manage various functions like Real-time motor control, Battery monitoring, Infotainment system, Navigation and GPS and Vehicle-to-Vehicle (V2V) communication. The main requirement in the design to be considered is to separate critical systems (like motor control and battery monitoring) from non-critical systems (like entertainment or navigation). Care must be taken that a failure in any non-critical module must not affect the operation of critical components, and must have the ability to update or restart individual components independently. Propose a suitable approach to design the operating system structure for the given requirement. Also justify how your approach ensures safety, fault isolation and the ability to update modules independently.	10	CO1	K4
2.		Consider the following Code #include <stdio.h> #include <stdlib.h> #include <unistd.h> #include <sys/types.h> #include <sys/wait.h> int main() {			

		pid_t pid1, pid2;
		pid1 = fork();
		if (pid1 > 0) {
		sleep(3);
		printf("Parent Process: PID = %d\n", getpid());
		wait(NULL);
		}
		else if (pid1 == 0) {
		printf("Child Process 1 (PID = %d, PPID = %d)\n", getpid(), getppid());
		pid2 = fork();
		if (pid2 > 0) {
		sleep(5);
		printf("Child Process 1 ends (PID = %d)\n", getpid());
		}
		else if (pid2 == 0) {
		sleep(1);
		printf("Child Process 2 (PID = %d, PPID = %d)\n", getpid(), getppid());
		sleep(5);
		printf("Child Process 2 (PID = %d, PPID = %d)\n", getpid(), getppid());
		}
		}
		return 0;}
		(i) Predict the output of the program and list the expected sequence of output lines. [4 Marks]
		(ii) Based on the process creation and termination sequence: Does any child process become a zombie or an orphan? Justify your answer using appropriate timing-based reasoning. [4 Marks].
		(iii) Suggest one modification (in code or timing) that would help prevent the creation of zombie or orphan processes (if any are present) in the given program. [2 Marks].
			10	CO1	K6

3.	a.	Devise a parallel program that performs the following: • Task 1: Calculates the sum of digits and prints its thread id. • Task 2: Identifies and prints all proper divisors of a given number N and computes their sum. The main program should prompt the user to input a value N and passes the input as arguments to both Task 1 and Task 2. After both the tasks complete, the main program displays the results. (7 Marks)	10	CO1	K6
	b.	Discuss the essential fields maintained in a Process Control Block (PCB) and analyze the modifications that take place within the PCB structure during an interrupt handling event. (3 Marks)			
4.		At the Student Services Center of a university, various types of support requests are received throughout the day. These requests fall into two categories:			

		Urgent issues, which require immediate attention and are prioritized based on how critical they are (lower numbers indicate higher urgency). General queries, which are less time-sensitive but still need to be addressed fairly and efficiently. The support team follows a strict protocol: All urgent issues are addressed first, one at a time, based on their criticality level. Once all urgent requests are resolved, the team shifts to handling general queries. General queries are handled using a fair time-sharing approach, where each request is given a fixed time slice of 4 minutes before moving to the next one in the queue. This process continues in a round-robin manner until all general queries are completed. On a particular day, the following support requests were recorded: R1: Submitted at time 0, marked as general, requires 10 minutes to resolve R2: Submitted at time 1, marked as urgent, needs 5 minutes, with a criticality level of 2 R3: Submitted at time 2, marked as general, requires 6 minutes R4: Submitted at time 3, marked as urgent, needs 4 minutes, with a criticality level of 1 R5: Submitted at time 4, marked as general, requires 8 minutes Using the above protocol, simulate the order in which the requests will be handled. At the end of the simulation, calculate the average waiting time, response time, turnaround time for all request and also find the system throughput.	10	CO2	K5
5.		A university data center runs a shared server for executing different types of student tasks. To manage the system efficiently, the server uses a Multilevel Feedback Queue Scheduling algorithm with the following policy: Queue 1 –Time Quantum = 2 ms Queue 2 –Time Quantum = 4 ms Queue 3 –FCFS, no time quantum Given the following processes: Process | Arrival Time(ms) | Burst Time(ms) P1 | 0 | 20 P2 | 2 | 8 P3 | 4 | 4 P4 | 6 | 9 P5 | 8 | 6 i. Discuss how the processes are scheduled by Multilevel Feedback Queue Scheduling ii. Construct the Gantt chart showing execution of all processes under MLFQ. iii. Calculate turn around time(TAT) and waiting time(WT) for each process. iv. Compute average TAT and WT.	10	CO2	K5

**********All the best **********