REG.NO.:

VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2025-2026

SLOT: G1 + TG1

Programme Name & Branch	: B. Tech Computer Science and Engineering
Course Code and Course Name	: BCSE305L - Embedded Systems
Faculty Name(s)	: Common to all
Class Number(s)	: Common to all
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 (1 – Remember, 2 – Understand, 3 – Apply,4 – Analyse,5 – Evaluate,6 – Create)
- Course Outcomes:

3. To examine the working principle and interface of typical embedded system components, create programme models; apply various optimization approaches including simulation environment and demonstration using debugging tools.
4. To evaluate the working principle of serial communication protocols and their proper use, as well as to analyze the benefits and drawbacks of real-time scheduling algorithms and to recommend acceptable solutions for specific challenges.

Q.No	Question	M	CO	BL
1.	A Smart Home Automation System consists of multiple interconnected devices such as sensors, controllers, and actuators that work together to monitor and control various home appliances. Implement an embedded system explaining how the operation of a smart home automation platform can be modelled using Data Flow Graph (DFG) and Control Data Flow Graph (CDFG) representations. Design and illustrate an appropriate system architecture showing the interaction between smart devices, embedded controllers, and user interfaces.	10	3	4
2.	Construct a Finite State Machine (FSM) model for an Autonomous Delivery Drone System. *System Description:* The system operates in a smart logistics environment where autonomous drones are responsible for delivering packages to customers. Each drone is equipped with GPS-based navigation, obstacle detection sensors, a camera module, and a package handling mechanism. The drone travels between a hub and multiple customer delivery points. *Functional Requirements:* The drone should be capable of receiving delivery requests, collecting the assigned package, and navigating to the specific destination by using GPS guidance. Throughout the flight, it must continuously monitor for obstacles and perform collision avoidance. Upon arrival at the delivery location, the drone should complete the package drop-off and then return to the base station. *Hint: FSM contains appropriate states, events and actions relevant to the drone operation.*	10	3	3
3.	Evaluate the given code and identify the errors with relevant validations to get the optimized code	10	3	3

```c
#include <stdio.h>
#define SIZE 50
int main() {
    int temp[SIZE];
    int i;
    int sum = 0;
    int avg;
    int count_high = 0;
    // Initialize temperature values
    for (i = 0; i < SIZE; i++) {
        temp[i] = (i * 3) + 5;   // simulate readings
    }
    // Compute sum
    for (i = 0; i < SIZE; i++) {
        sum += temp[i];
    }
    // Compute average
    avg = sum / SIZE;
    // Count values above average
    for (i = 0; i < SIZE; i++) {
        if (temp[i] > avg) {
            count_high++;
        }
    }
    printf("Average = %d, Above Avg Count = %d\n", avg, count_high);
    return 0;
}
```

4. Design with a neat sketch, a multithreaded model for an embedded multimedia device in which audio playback, video rendering, and user interaction execute concurrently. Write a pseudocode using Pthread to create and manage separate threads for audio processing, video display and user input handling. | 10 | 4 | 4

5. A smart phone service centre receives service request for several phones, where each service operation is treated as a periodic real-time task managed by a Real-Time Operating System (RTOS) scheduler. The service task for the phones is characterized by the following parameters:

Task	Period	Execution Time
A	3	1
B	5	1
C	6	1
D	8	2
E	10	1

For the above task parameters, construct a schedule using Rate Monotonic Scheduling (RMS) and Earliest Deadline First (EDF). Compare the resulting schedules to analyse which algorithm utilizes the CPU more efficiently. (Assume that all tasks arrive at time t = 0 and the deadline of each task is equal to its period) | 10 | 4 | 5

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