Y/K/TX

Reg. No: [redacted]

Final Assessment Test – November 2024

VIT Vellore Institute of Technology

Course: **BCSE305L - Embedded Systems**

Class NBR(s): **8125**

Slot: **A1+TA1**

Time: **Three Hours**

Max. Marks: **100**

- **KEEPING MOBILE PHONE/ELECTRONIC DEVICES EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Classify an embedded system in three distinct ways based on performence and examplify how its applications differ from those of conventional computer systems? Your analysis on hardware, software, and design constraints.
2. Summarise the constraints of 8051 micro controller in detail and design a self-configurable micro controller to overcome those constraints with neat illustration and explanation.
3. Explain the operation of an R-2R ladder DAC (Digital to Analog converter) with a neat sketch in embedded systems when a 3-bit DAC is given a binary code of 101.
4. Discuss the process of interfacing the HC-SR04 ultrasonic module with an 8051 microcontroller. What are the critical steps for configuring and programming the system to accurately measure distance?
5. Identify and evaluate the constraints & challenges in designing any special purpose embedded system and choose the appropriate identified parameters for the following system with enough justifications:-

   GPS(Global Positioning system).
6. Illustrate five code optimization techniques, providing relevant examples for each.
7. Propose a model to capture the behavior of heartbeat monitoring system designed to continuously monitor a person's pulse and activate a siren alert when the heart rate exceeds a predefined threshold. This system should consists of two main tasks: pulse monitoring and siren activation.
8. Explore and elaborate on the requirements of a real-time hybrid scheduler. Determine the execution of tasks with detailed Task-Time line graph for the following tasks.

Task	Arrival Time	Burst time	deadline
T1	0	10	33
T2	4	3	28
T3	5	10	29

9.a) How does the differences between standard and extended CAN frame formats effects the performance and scalability of a CAN network, and what implications do these differences have for system design in embedded applications?

OR

9.b) How does the I2C protocol handle device addressing, and what strategies can be employed to manage potential address conflicts in a system with multiple I2C devices?

10.a) Create a next-generation smart refrigerator featuring the following specifications:

- Auto-ordering capability
- Enhanced cooling efficiency
- SMS notifications.

The design should encompass:

Conceptual architecture

Detailed module diagram showcasing relevant sensors and actuators

Hardware architecture

Software architecture

Overall operation illustrated through flowcharts.

OR

10.b) Create a smart petrol, diesel, gas and electric station to meet the following specifications and objectives: -

Specifications:

- Number of petrol and diesel terminals
- Number of gas and electric charging terminals

Objectives:

- Fully automated – no humans are involved
- SMS and voice-based input interfaces will be used for the interaction with customers

Deliverables:

Petrol, diesel, gas and electric display counters

Total as well as individual sales report

The design should encompass:

Conceptual architecture

Detailed module diagram showcasing relevant sensors and actuators

Hardware architecture

Software architecture

Overall operation illustrated through flowcharts.

⇔⇔⇔ **Y/K/TX** ⇔⇔⇔