VIT

Vellore Institute of Technology

Reg. No. : 21BPS1182

Final Assessment Test (FAT) - May 2024

Programme	B.Tech.	Semester	WINTER SEMESTER 2023 - 24
Course Title	EMBEDDED SYSTEMS	Course Code	BCSE305L
Faculty Name	Prof. Guga Priya G	Slot	D1+TD1
		Class Nbr	CH2023240501844
Time	3 Hours	Max. Marks	100

General Instructions:

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Section - I

Answer all questions (6 X 5 Marks = 30 Marks)

01. List out a few characteristics that make an embedded system unique. [5]

02. Demonstrate the structure of memory within an embedded system. Create a detailed diagram of it. [5]

03. A servomotor is used in the robotic arm control mechanism. Justify the role of PWM in the control of the position of the servomotor and there by the robotic arm. [5]

04. With a neat diagram enunciate the process for developing embedded software. [5]

05. Three nodes are seeking the service of the CAN bus at the same time. Which node would be given the bus? Justify your answer with a suitable example. [5]

06. Is EDF really a dynamic priority scheduling algorithm? Justify [5]

Section - II

Answer all questions (7 X 10 Marks = 70 Marks)

07. Design a bi-directional counting mechanism to find out the number of people visiting the central library in your township. Use top-down approach to design and discuss with a neat diagram. The requirements are given below. [10]
    - Visitors can enter only through the common entrance and exit through the common exit.
    - An object sensor is placed at the common entrance.
    - The library is open from 10:00 AM to 06:00 PM, at the end of the day, the librarian should be updated with the total number of visitors for that day.
    - Use the appropriate I/O devices and display devices needed to interface with a microcontroller to achieve the given task.

08. Design an automatic hand sanitizer dispenser and temperature measurement system for a super market to minimize the COVID spread. The requirements are given below. [10]
    The system should be contact-less.
    IR sensor is used to identify a person's hand and servo motor is used to dispense sanitizer.

- The door opens (use a DC motor to mimic door opening) only if the temperature is within the normal temperature limit.
- An alarm is sounded if a person is identified with a temperature that is not within the limit.

Draw the connection diagram and write an Arduino program to implement this system.

09. A fully automatic washing machine comes with several programs and washing modes that will work at the push of a button. Analyse and tabulate various technical and non-technical features required while choosing an appropriate microcontroller or processor and memory for designing the machine. Is using ARM Cortex-M3 as the processor for it a good choice? Justify. [10]

10. Analyse and tabulate various technical and non-technical features of SPI, I2C, Bluetooth, and WiFi protocols. [10]

11. For an electronic weighing machine that prints the weight in kg and a proverb when an INR 5 coin is inserted. Identify and list out its essential requirements, and represent its Petri-net model and UML state diagram with proper notations. [10]

12. Provide an example of an automotive electronic control unit (ECU) and demonstrate how the operating system executes periodic, aperiodic, and sporadic real-time tasks to exemplify the concept. [10]

13. Outline the functions of embedded systems in a vehicle. Enumerate the primary embedded system applications found in an electric car. [10]