Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (R,S), MAY 2024
ROBOTICS AND AUTOMATION
(2020 SCHEME)

Course Code : 20RBT206

Course Name: Microcontrollers and Embedded Systems

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Differentiate between microcontroller and microprocessor. Give examples.
2. Give the bitwise functional details of PSW in 8051.
3. Explain the operation of following instructions with proper syntax.
   (i) DJNZ (ii) CJNE (iii) MUL
4. Give the structure of the TCON register in 8051.
5. Define embedded system. Give 3 applications of embedded systems from different areas of daily life.
6. What is Hardware - Software Co-Design?
7. What are the different types of memories available in Arduino UNO?
8. How the speed of a DC motor can be varied using PWM in Arduino Uno.
9. List out the two different types of OS Kernels and explain them briefly.
10. Draw the I2C Bus system structure.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Describe the architecture of 8051 with a block diagram. (9)
    b) Develop an 8051-assembly language program to find the square of a number stored at external memory location 4000H. Store the 16bit result in memory locations 4001H and 4002H. (5)

OR

12. a) List out 5 addressing modes of 8051 with examples for each. Briefly explain the working of each addressing mode. (7)
    b) Write an 8051-assembly language program to add ten 8bit numbers stored at external memory locations 4500H to 4509H. Store the result in external memory locations. (7)

MODULE II

13. a) Distinguish various operating modes of timers in 8051. How can the mode be configured? (7)
    b) Write an 8051-assembly language program to blink an LED connected at P1.0. Create a delay subroutine and insert that delay between each blink. (7)

OR

14. a) Describe the interrupt structure of 8051. (7)
    b) Write a program to interface an ADC to 8051 with a suitable interfacing diagram. (7)

MODULE III

15. a) Bring out the different modules in embedded system tool chain. Explain their functionalities. (8)
    b) List and classify different types of memories used in embedded systems. (6)

OR

16. a) Explain the Embedded system design process in detail. (9)
    b) What is an SoC. Explain with block diagram (5)

MODULE IV

17. a) Sketch the board level block schematic of Arduino Uno development board and explain. (7)
    b) Write an Arduino program to turn on an LED on pushing on a switch and turn off the same LED on next push on the same switch. Assume that the LED is connected to pin 4 and switch is connected to pin 2 of Arduino Uno. Support with interfacing diagram. (7)

OR

18. a) Which is the microcontroller used in Arduino Uno board. Give the features of this microcontroller. (7)
    b) Write a program to interface the temperature sensor LM35 with Arduino Uno, and display the temperature on Arduino IDE serial monitor. Support with interfacing diagram. (7)

MODULE V

19. a) What is 'task' in embedded OS? Draw the state diagram and explain different states of tasks. (8)
    b) Differentiate hard and soft real-time systems with examples. (6)

OR

20. a) Compare General purpose OS with RTOS. (4)
    b) Explain the following communication protocols.(i) USB (ii) SPI (10)

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