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Question Paper Code:U3302

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Professional Elective

Electrical and Electronics Engineering

21EEV302– EMBEDDED C-PROGRAMMING

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Write a C program to calculate the sum of elements in an array and describe its approach to manage edge cases in scenarios where the array is empty. CO2- App
2. Explain the importance of a structured program development approach in C, and its impact on code readability and maintainability. CO1- U
3. Explain the significance of header files in Embedded C projects. CO1- U
4. Translate the following requirement into Embedded C: "Create a 1-second delay using a loop without using built-in delay functions." CO1- U
5. Develop an 8051 C program to perform a logical AND operation on two input values and display the result on an LED. CO3- App
6. Compare the use of timers and software delays in 8051 by highlighting the advantages of timers in real-time applications. CO1- U
7. Describe the role of the 8051 UART in serial communication, emphasizing its function in enabling data transmission and reception. CO1- U
8. Interpret the significance of interrupts in real-time systems and also provide examples of applications where interrupts are essential. CO1- U
9. Illustrate the process of interfacing an LCD with 8051 including the initialization sequence and data transfer protocol. CO1- U
10. Write 8051 C code to display the text "Hello" on an LCD using 4-bit mode. CO3- App

PART – B (5 x 16= 80 Marks)

11. (a) Analyze the significance of control structures (if-else, loops, and switch) in controlling program flow in C. Provide a detailed example of a scenario where improper control flow leads to program inefficiency and explain how it can be resolved. CO4- Ana (16)
- Or
- (b) Examine how different data types and operators in C are used to manipulate data. Discuss the implications of choosing appropriate data types for memory optimization and computational efficiency, with examples. CO4- Ana (16)
12. (a) Develop a structured C program to calculate the area of a rectangle. The program should prompt the user to input the length and width, perform the calculation and display the result. CO2- App (16)
- Or
- (b) Construct a C program to find the largest element in an array of 10 integers. The program should prompt the user to input the array elements and then display the largest element. Make use of a loop to traverse the array. CO2- App (16)
13. (a) Develop a C program for the 8051 microcontroller to serialize an 8-bit data and transmit it serially using the serial port. Configure the serial port for 9600 baud rate and display the transmitted data on Port 2. Identify the steps involved in serializing and transmitting the data. CO3- App (16)
- Or
- (b) Construct a C program for the 8051 microcontroller to read two 8-bit numbers from Port 1 and Port 2. Perform a bitwise NAND operation on them and display the result on Port 0. Utilize appropriate logic operators in your program. CO3- App (16)
14. (a) An 8051 microcontroller is handling three interrupts: External Interrupt 1 (INT1): Triggered by a falling edge on Port 3.3. Timer 1 Interrupt: Configured to generate an interrupt every 20 ms. Serial Port Interrupt: Triggered when data is received. CO4- Ana (16)
- Analyze the following:
1. What happens if all three interrupts occur simultaneously?
 2. How does the IP (Interrupt Priority) register help in managing these interrupts?
 3. Suggest a priority scheme for these interrupts and justify your choice.

Or

- (b) An 8051 microcontroller is configured to use Timer 0 in mode 1 to generate a delay of 100 ms. CO4- Ana (16)

Analyze the following:

1. Calculate the values to be loaded into TH0 and TL0 for a 12 MHz crystal.
2. Identify the limitations of using Timer 0 in mode 1 for generating longer delays (e.g., 1 second).
3. Suggest an alternative method to generate a 1-second delay using the 8051 timers.

15. (a) Construct a circuit to interface an 8-bit DAC (e.g., DAC0808) with an 8051 microcontroller. Write a C program to generate a square wave using the DAC. Experiment with different delay values to change the frequency of the square wave. CO3- App (16)

Or

- (b) Plan and construct a circuit to interface a unipolar stepper motor with an 8051 microcontroller. Write a C program to rotate the motor in the clockwise direction with a step angle of 90°. Utilize a driver circuit (e.g., ULN2003) to control the motor. CO3- App (16)

