2023
M.Sc.
Third Semester
CORE – 09
PHYSICS
Course Code: MPHC 3.11
(Embedded Systems: Introduction to Microcontrollers)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Describe the characteristics of an embedded system, including its advantages and disadvantages. 5
   (b) Discuss about the bus structure of 8085 microprocessor. 4
   (c) Write an assembly language program to add and subtract two 8-bit numbers. 5

2. (a) Discuss the embedded system architecture and its importance. 4
   (b) Explain the timing diagram of 8085 microprocessor in detail. 6
   (c) Assume two numbers X and Y, 8-bit each, are stored in memory locations 2400H and 2401H. Use assembly language of 8085 microprocessor to calculate $Z1$ and $Z2$ by the following equations and store the results in memory locations 2402H and 2403H, where $Z1 = X + Y - 2$ and $Z2 = X - Y + 10$. 4

UNIT –II

3. (a) Draw the block schematic and architecture of 8051. 3
   (b) Explain about ROM memory map. 5
   (c) Discuss the structure of special function register (SFR) memory. 6

4. (a) Write the difference between RET and RETI instruction. 2
   (b) Describe the input/output port of 8051 microprocessor and its operation. 6

(c) What is meant by jump? Mention the types of jump instructions. Differentiate between jump and call operations. 1+3+2=6

UNIT–III

5. (a) What are the different addressing modes supported by the 8051? Explain with examples. 3+2=5
   (b) Write a C program assuming that 8 LEDs are connected to port 1, to flash LEDs 100 times using do-while loop. 6
   (c) Explain the PSW in 8051 microcontrollers. 3

6. (a) Explain rotate operations in C. List the steps involved for left and right rotation. 5
   (b) Discuss the conversion of ASCII to BCD with the help of an examples. 6
   (c) Describe the three types of accessing memory area of 8051. 3

UNIT–IV

7. (a) Define interrupt. What are the steps followed to service an interrupt? Give the format of the interrupt enable register. 1+2+2=5
   (b) Explain the timer or counter mode of operation. 5
   (c) Distinguish between level-triggered and edge-triggered interrupt. 4

8. (a) Differentiate between synchronous and asynchronous systems. Discuss the format of asynchronous serial data frame structure. 4+3=7
   (b) Illustrate 8-bit DAC interfacing with 8051. Show its DAC equivalent analog output with an example. 3+2=5
   (c) Assuming that R = 5 K and I_{ref} = 2 mA, calculate V_{out} for the following binary inputs: 1×2=2
      (i) 10011001 binary (99H)
      (ii) 11001000 (C8H)

UNIT–V

9. (a) What is embedded programming? Explain the basic structure of embedded C program. 1+4=5
   (b) Discuss about firmware debugging and emulators. 3+3=6
   (c) Write a program for fire alarm buzzer using Arduino programming. 3

10. (a) Explain the simulator in embedded system. List its advantages and disadvantages. 3+2 =5

(b) What is the need for an infinite loop in embedded systems? 2

(c) Write a program using 8051 microcontroller, LCD and keypad to display the user input at the output. 7