

**2021**  
**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) With the help of block diagrams, discuss the difference between microprocessor and microcontroller. 3
- (b) Draw internal architecture of 8085 microprocessor and explain function of the following registers 8
  - (i) Accumulator
  - (ii) General purpose register
  - (iii) Stack pointer
  - (iv) Program counter
  - (v) Instruction register
  - (vi) Status register
  - (vii) Temporary register
- (c) Explain briefly three different instruction word size for 8085 microprocessor. Provide example for each type. 3
2. (a) Explain the different types of buses in the microprocessor. 3
- (b) Draw the pin diagram of 8085 microprocessor and describe the function of each pin. 6
- (c) What are the different addressing mode for the 8085 microprocessor? Provide example for each mode. For 8085 microprocessor, what are the mnemonic codes for the following operation?
  - (i) move the content of register B to A
  - (ii) add the content of register C to accumulator 3+2=5

**UNIT-II**

3. (a) Draw the internal architecture of 8051 microcontroller and explain

- the function of each register. 8
- (b) Explain the register bank selection in PSW structure. 2
- (c) Explain various Input/Output ports of 8051 microcontroller. 4
4. (a) Explain programming model of 8051 microcontroller. What are the bit address assigned to the byte address 28H of bit addressable RAM? 6+2=8
- (b) Explain the different addressing mode for 8051 microcontroller and provide an example of each mode 3
- (c) Write the instructions to initialize the accumulator and register R<sub>1</sub> with 81H and 69H respectively and subtract these two numbers. 3

### UNIT-III

5. (a) What are the different categories of instruction for 8051 microcontroller? With the help of examples, provide five instructions for each category. 8
- (b) Write the instruction to load the value FFH into
- (i) Internal RAM address 15H
- (ii) External RAM address 1000H 3
- (c) Write a program to add three numbers stored at internal RAM address 10H, 1H, 12H and store the lower byte of result into internal RAM address 20H and upper bits into 21H. 3
6. (a) Identify which of the following byte address of SFRs are the bit addressable and not bit addressable: 80H, 81H, 83H, 87H, 88H and 90H? 3
- (b) What are the bit addresses of the following given byte addresses of the SFRs?
- (i) 80H (Port 0) (ii) 88 H (TCON) (iii) 90H (Port 1)
- (iv) A0H (Port 2)) (v) B0H (Port 3) (vi) D0H (PSW)
- (vii)E0H (A) (viii) F0H (B) 4
- (c) With the help of address range, explain different type of Jump operations. Give the example of each jump instruction. With the help of examples, describe the Loop and Call Subroutine instructions. 4+3=7

## UNIT-IV

7. (a) What are the basic functions of a Timer in 8051 microcontroller?  
How many timers are there in 8051 microcontroller, give their bits detail. List SFRs used to control the timer activities  $2+1+2=5$
- (b) Explain the TMOD register. Write the instruction to configure
- (i) Timer 1 as a interval timer in Mode 2 and Timer 0 as an interval timer in Mode 0. Start/stop operations of both timers controlled by software. 2
- (ii) Timer 1 as an event counter in Mode 1 and Timer 0 as an event counter in Mode 1. Start/stop operations of both timers controlled by software. 2
- (c) What will be the frequency and time period of the Timer Clock if the crystal oscillator frequency is 24 Mz? Find the count to be loaded into timer registers to generate a time delay of 500  $\mu$ s?  $3+2=5$
8. (a). Briefly describe the interrupts available in 8051? Explain the term interrupt vector table and interrupt service routine. What are the two registers to control operations of all the five interrupts? 7
- (b) Explain the configuration of Interrupt Enable Register (IE). 4
- (c) Discuss about the interrupt (IP) register. 3

## UNIT-V

9. (a) What are the different components of Embedded Systems Software Development Tool? Explain the function of each of them. 7
- (b) Explain the Embedded product development Cycle (EDLC). 4
- (c) Explain about the Integrated Development Environment (IDE). 3
10. (a) Explain the internal architecture of Ardiuno. 6
- (b) Discuss the pin diagram of Ardiuno microcontroller. 5
- (c) Write a C language program for LED blinking. 3