

**November 2025**  
**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) Discuss the embedded system architecture and its importance. 6  
(b) What is meant by a stack? Explain the implementation of stack in 8051  $\mu$ P. 5  
(c) Write an assembly language program to shift an 8-bit number left by 1-bit. Assume the number to be shifted is stored in C050, then where is the result stored. 3
2. (a) Explain the elemental description of embedded processors and microcontrollers 5  
(b) Elaborate on the SIM instruction format of 8085  $\mu$ P. 5  
(c) Write a program to execute an assembly language programming of 8051  $\mu$ P to subtract two 8-bit data stored in 8050H. 4

**UNIT-II**

3. (a) Draw and explain program status word register of 8051. 6  
(b) Write an assembly program to multiply the contents of location 20H and 21H. Store result at 22H (lower byte) and 23H (higher byte) 4  
(c) Discuss conditional jump instructions with syntax. 4
4. (a) Explain port 2 structure of 8051 microcontroller. 6

- (b) What are assembler directives? Discuss the following assembler directives 4
- (i) ORG,
  - (ii) EQU
  - (iii) DS
- (c) Write 8051 assembly instructions to compare the contents of A with the contents of 20H. If contents are equal, store 00H in 21H, else store FFH in 21H. 4

### UNIT-III

5. (a) Describe the role of the DPTR register in indexed addressing mode. How is it used in accessing external memory? 6
- (b) Write a 8051 C program to toggle all the bits of P0 and P2 continuously with a 250 ms delay. 5
- (c) Show how the flag register is affected by the following instructions: 3
- ```
MOV A, #0F5H
ADD A, #0BH
```
6. (a) Assume the 4 bytes of hexadecimal data: 25H, 62H, 3FH, and 52H. 6
- (i) Find the checksum byte.
  - (ii) Perform the checksum operation to ensure data integrity.
  - (iii) If the second byte 62H has been changed to 22H, show how checksum detect the error.
- (b) Explain the logical instructions used for bitwise operations for AND, OR, and XOR in the 8051 microcontroller. Illustrate their syntax and functionality with suitable examples. 6
- (c) Write a 8051 C program to send hex values for ASCII characters of 0,1,2,3,4,5,A,B,C and D to port 1. 2

### UNIT-IV

7. (a) Write a C program to generate a square wave of 1 KHz frequency on P2.0. Assume crystal frequency = 11.0592 MHz. 7
- (b) Explain the TCON (Timer Control) register of the 8051 microcontroller. Describe its bit format and discuss its role in timer operation with an example. 7

8. (a) What do you mean by interrupt priority in 8051? Explain its nature with suitable examples of simultaneous interrupts. 7  
(b) Explain how the digital output from a serial ADC is transmitted to 8051. Why is serial communication suitable here? 7

### UNIT-V

9. (a) What is seven-segment LED display? What are two different configurations of seven-segment LED display? Explain. 5  
(b) Write an Arduino program to display “SENSOR” on LCD screen. 4  
(c) Discuss the role of integrated development environment (IDE) for embedded software development. 5
10. (a) What is the difference between compiler and cross-compiler? 4  
(b) Describe the phases of embedded product development life cycle model. 5  
(c) Explain why the spiral model is called an evolutionary model of software development. 5
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