| Question Paper Code | 13954 |
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## B.E./ B.Tech - DEGREE EXAMINATIONS, NOV / DEC 2025
Fifth Semester
### Mechanical and Automation Engineering
### 20ESEI501 - PLC AND MICROCONTROLLER
Regulations - 2020

Duration: 3 Hours                                                              Max. Marks: 100

### PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

|  |  | Marks | K-Level | CO |
|---|---|---|---|---|

1. What does XIC stand for in PLC programming?    *(1  K1  CO1)*
   (a) Examine If Close                                (b) Examine Input Current
   (c) Execute Input Command                           (d) Examine Internal Condition
2. Which language is NOT commonly used for PLC programming?    *(1  K1  CO1)*
   (a) Ladder Logic                                    (b) Functional Block Diagram (FBD)
   (c) Structured Text                                 (d) HTML
3. In PLC programming, what is the purpose of a control instruction?    *(1  K1  CO2)*
   (a) To manipulate data in registers       (b) To control the program flow or execution
   (c) To count pulses from an input          (d) To retain the output state
4. The Up/Down Counters can be used in a bottling system    *(1  K1  CO2)*
   (a) To delay the motor start
   (b) To count bottles filled and trigger an alert when a set count is reached
   (c) To set the system speed
   (d) To stop the conveyor every minute
5. How much internal RAM does the 8051 microcontroller have?    *(1  K1  CO3)*
   (a) 64 bytes          (b) 128 bytes          (c) 256 bytes          (d) 512 bytes
6. Relate the purpose of the stack in the 8051 architecture.    *(1  K1  CO3)*
   (a) To store program code             (b) To store return addresses and temporary data
   (c) To execute arithmetic operations   (d) To store special function registers (SFRs)
7. Identify the instruction used for 2's complement code conversion in the 8051.    *(1  K1  CO4)*
   (a) CPL              (b) MOV              (c) XCH              (d) CLR
8. Recall the function of the RETI instruction in 8051 programming.    *(1  K1  CO4)*
   (a) Ends a subroutine   (b) Returns from an interrupt and enables further interrupt handling
   (c) Ends a loop         (d) Skips to the next instruction
9. Identify the communication standard used by Bluetooth.    *(1  K1  CO5)*
   (a) SPI              (b) I2C              (c) IEEE 802.15.1              (d) CAN
10. Relate why I2C is preferred over SPI for long-distance communication in embedded systems?    *(1  K1  CO5)*
    (a) It operates at higher frequencies      (b) It supports multiple devices with fewer pins
    (c) It has a simpler protocol              (d) It is always faster

### PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

11. Compare PLC and computer.    *(2  K2  CO1)*
12. Explain with a simple PLC ladder logic example how any one universal logic gate.    *(2  K2  CO1)*
13. Classify the three main types of timers in PLC's.    *(2  K2  CO2)*
14. Infer the difference between retentive and non-retentive timers in PLC's and how each type affects the timing process.    *(2  K2  CO2)*
15. Interpret the alternate functions of Port 0.0 to 0.3 pins in the 8051 microcontroller.    *(2  K2  CO3)*
16. Explain the functioning of CPL instruction.    *(2  K2  CO3)*
17. Outline the difference between hardware and software interrupts.    *(2  K2  CO4)*

*K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create*                    **13954**

| | | | |
|---|---|---|---|
| 18. | Write a program to find 2's complement using 8051. | 2 | K2 CO4 |
| 19. | Illustrate the need for keyboard denouncing. | 2 | K2 CO5 |
| 20. | Write a program to swap two numbers using 8051. | 2 | K2 CO5 |
| 21. | Classify and describe any four input and output devices commonly used in PLC's. | 2 | K2 CO1 |
| 22. | Write any one math instruction in PLC with an example. | 2 | K2 CO2 |

## PART - C (6 × 11 = 66 Marks)
### Answer ALL Questions

23. a) Demonstrate how the architecture of a PLC is applied in an industrial automation system, using a diagram.   11   K2   CO1

**OR**

b) Construct ladder logic diagrams to implement basic logic gates and universal gates using PLC instructions.   11   K2   CO1

24. a) Explain the principles of on delay and off delay timer logic by designing a control circuit diagram.   11   K2   CO2

**OR**

b) Write a ladder logic program for Automatic bottle filling system.   11   K2   CO2

25. a) Draw and Explain the pin diagram of 8051 microcontroller and explain the importance of each pin signal available in this controller.   11   K2   CO3

**OR**

b) Describe the Memory Organization of 8051 Microcontroller.   11   K2   CO3

26. a) Write a program to retrieve the contents of these locations one by one, and output it to port p1 which is connected to a seven segment display which display the numerals repeatedly with a delay of 100ms between displays. The common cathode seven segment codes for the numerals 0 to 9 are given in the below table. Store this look up table in ROM locations 400H onwards.   11   K2   CO4

| Decimal Digit | Seven segment code |
|---|---|
| 0 | 3F |
| 1 | 06 |
| 2 | 5B |
| 3 | 4F |
| 4 | 66 |
| 5 | 6D |
| 6 | 7D |
| 7 | 07 |
| 8 | 7F |
| 9 | 6F |

**OR**

b) Write a program to convert Hexadecimal to decimal number using 8051 microcontroller.   11   K2   CO4

27. a) Illustrate the control system design of washing machine using 8051 microcontroller programming.   11   K2   CO5

**OR**

b) Show how to program and interface LED to an 8051 microcontroller.   11   K2   CO5

28. a) (i) Write short notes on interrupt structure of 8051 Microcontroller.   6   K2   CO4
       (ii) Explain the key features of the I2C communication protocol.   5   K2   CO5

*K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create*   **13954**

**OR**

b) (i) Write a delay program with a single register loaded with its maximum value and calculate its time delay machine cycle.  6  K2  CO4

(ii) Explain the key features of the SPI communication protocol.  5  K2  CO5