Reg. No.																

Question Paper Code	13153

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fifth Semester

Mechanical and Automation Engineering

20ESEI501 - PLC AND MICROCONTROLLER

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which programming language is commonly used for Programmable Logic Controller (PLC)s? (a) Python (b) Ladder Logic (c) C++ (d) Java	1	K1	CO1
2.	What is the basic unit of a ladder logic diagram? (a) Relay (b) Coil (c) Ladder rung (d) Branch	1	K1	CO1
3.	Contrast the roles of the CPU and I/O modules in a PLC. (a) CPU controls hardware, I/O modules handle programming (b) CPU executes program logic, I/O modules interface with external devices (c) CPU stores data, I/O modules provide power (d) Both CPU and I/O modules perform identical roles	1	K2	CO1
4.	Interpret how a Branch instruction improves flexibility in PLC programming. (a) By reducing program memory size (b) By creating multiple logic paths (c) By deleting unused instructions (d) By preventing relay overload	1	K2	CO1
5.	In PLC programming, what is the purpose of a control instruction? (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	1	K1	CO2
6.	What does the MOV instruction do in PLC programming? (a) Moves data from one location to another (b) Adds two values together (c) Subtracts one value from another (d) Multiplies two values	1	K1	CO2
7.	Illustrate the role of a Cyclic Timer in automated processes. (a) It repeats ON/OFF actions for cyclic processes, like alternating pumps (b) It delays the ON state once per cycle (c) It holds elapsed time after power loss (d) It increases speed	1	K2	CO2
8.	Which PLC instruction is used to jump over a section of code? (a) GOTO (b) JUMP (c) SKIP (d) RETURN	1	K1	CO2
9.	How many I/O ports are available in the 8051 Microcontroller? (a) 2 (b) 4 (c) 8 (d) 6	1	K1	CO3
10.	Outline the steps involved when the 8051 Microcontroller executes an interrupt service routine. (a) Checks interrupt flag, clears it, executes ISR, and returns (b) Starts ISR without checking (c) Saves current instruction and resets memory (d) Stops execution completely	1	K2	CO3
11.	Demonstrate how the 'MOV A, #25h' instruction works in 8051 assembly language. (a) Moves data from accumulator to memory (b) Loads accumulator with the immediate value 25h (c) Transfers data to SBUF (d) Clears the accumulator	1	K2	CO3

12.	Which instruction performs a logical AND operation in the 8051Microcontroller? (a) ANL (b) ORL (c) XRL (d) ADD	*1*	*K1*	*CO3*
13.	Identify the instruction used for 2's complement code conversion in the 8051. (a) CPL (b) MOV (c) XCH (d) CLR	*1*	*K1*	*CO4*
14.	State the purpose of a lookup table in 8051 assembly language. (a) To store pre-defined data for quick retrieval (b) To control memory addressing (c) To handle arithmetic operations (d) To generate interrupts	*1*	*K1*	*CO4*
15.	Illustrate how DJNZ instruction is used to create a precise delay. (a) It loops a set number of times, decreasing the count until zero (b) It directly loads a delay value (c) It resets after each iteration (d) It performs immediate addition	*1*	*K2*	*CO4*
16.	Identify the arithmetic operation performed by the instruction SUBB A, R0. (a) Addition (b) Subtraction with borrow (c) Multiplication (d) Division	*1*	*K1*	*CO4*
17.	Which protocol uses clock and data lines for communication between devices? (a) UART (b) I2C (c) SPI (d) CAN	*1*	*K1*	*CO5*
18.	What type of motor rotates in steps and can be positioned precisely in automation applications? (a) DC motor (b) Servo motor (c) Stepper motor (d) Synchronous motor	*1*	*K1*	*CO5*
19.	Compare the number of wires required for SPI and I2C communication. (a) SPI requires more wires than I2C (b) I2C requires more wires than SPI (c) Both require the same number of wires (d) Both use a single wire	*1*	*K2*	*CO5*
20.	Which register in the 8051 Microcontroller is used for serial communication? (a) SP (b) SBUF (c) DPTR (d) PSW	*1*	*K1*	*CO5*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	How a PLC can be programmed to automation applications?	*2*	*K1*	*CO1*
22.	What is a PLC? What are the main advantages and disadvantages of PLC?	2	*K1*	*CO1*
23.	Describe the operation of retentive timer.	2	*K1*	*CO2*
24.	Develop a ladder diagram to switch ON 2 motors simultaneously.	2	*K2*	*CO2*
25.	Write the function of TMOD register in 8051 Microcontroller.	2	*K2*	*CO3*
26.	How register banks are selected in 8051?	2	*K1*	*CO3*
27.	Mention the registers used for serial communication in 8051 Microcontroller.	2	*K2*	*CO4*
28.	Why is code conversion necessary in Microcontrollers?	2	*K2*	*CO4*
29.	Give the 4 logic signals specified by SPI bus.	2	*K1*	*CO5*
30.	State the applications of the CAN Protocol.	2	*K1*	*CO5*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Discuss in detail about the input and output devices available in PLC.	*10*	*K2*	*CO1*
		OR			
	b)	Draw a ladder diagram for a three motor system having the following conditions. Motor 1 (M1) starts as soon as the start switch is switched on; after 10 sec, M1 goes off and motor 2 (M2) starts. After 5 sec, M2 goes off and M3 starts. After 10 sec, M3 goes off, M1 starts and the cycle is repeated.	*10*	*K2*	*CO1*

32.	a)	Develop a ladder logic program for Automatic bottle filling system.	*10*	*K2*	*CO2*
		OR			
	b)	Explain with a ladder logic program for automatic lubrication of supplier conveyor belt.	*10*	*K2*	*CO2*
33.	a)	Explain the Arithmetic Instruction set of 8051 Microcontroller with an example for each instruction.	*10*	*K2*	*CO3*
		OR			
	b)	Discuss the importance of interrupt and its structure in 8051 Microcontroller.	*10*	*K2*	*CO3*
34.	a)	Develop a program using 8051 Microcontroller instructions to add two 8 bit numbers.	*10*	*K2*	*CO4*
		OR			
	b)	Write a program using 8051 Microcontroller instructions to find the square of a number (1 to10) using Look up table.	*10*	*K2*	*CO4*
35.	a)	Draw a circuit diagram for keyboard interface with 8051 Microcontroller and write a program for reading any key.	*10*	*K2*	*CO5*
		OR			
	b)	Explain with a neat block diagram and Assembly language program to Interface servo motor with 8051 Microcontroller.	*10*	*K2*	*CO5*
36.	a) i)	Write a program to copy a block of 10 bytes from RAM location starting at 37h to RAM location starting at 59h.	*5*	*K2*	*CO4*
	ii)	Explain the key features of the I2C communication protocol.	*5*	*K2*	*CO5*
		OR			
	b) i)	Write a delay program with a single register loaded with its maximum value and calculate its time delay machine cycle.	*5*	*K2*	*CO4*
	ii)	Explain in detail about the interfacing of a device using Bluetooth protocol with 8051.	*5*	*K2*	*CO5*