Enrollment No......................................

Faculty of Engineering

End Sem Examination December 2024

EE3EI01 PLC & Applications

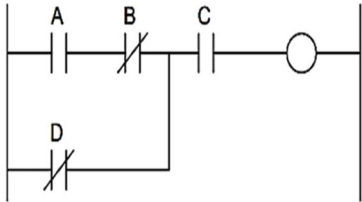Programme: B.Tech.   Branch/Specialisation: EE

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	PO	CO	PSO
Q.1	i.	PLC operates on the following signals:	**1**				
		(a) Analog (b) Digital		1	1,2	1	1,4
		(c) Impulse (d) Frequency					
	ii.	Programming language typically used to program a PLC is:	**1**				
		(a) C++ (b) Java		1	1,2	2	1,4
		(c) Ladder Logic (d) Python					
	iii.	EQU, LES, LEQ are examples of which of the following instructions?	**1**				
		(a) Comparison instructions					
		(b) Sequencer instructions		1	1,2	2	1,4
		(c) Data handling instructions					
		(d) Composite instructions					
	iv.	The Boolean representation of this PLC program is:	**1**				

				2	1,2,3	1	1,4

(a) ABC + D   (b) C + (A + B) D

(c) C + D (A + B)   (d) C (AB + D)

v. The function of a PLC's watchdog timer is: **1**
   (a) To keep track of the time
   (b) To schedule tasks
   (c) To trigger events   1 1,2 3 1,4
   (d) To monitor the PLC's operation and reset the PLC in case of a malfunction

vi. Which of the following is not usually associated with a PLC counter instruction? **1**
   (a) Address   (b) Preset value   1 1,2 3 1,2
   (c) Time based   (d) Accumulated value

vii. The function of a PLC's data logging is: **1**
   (a) To store data from the industrial process
   (b) To store the PLC's configuration settings   1 1 3 1,3
   (c) To record data over a period of time
   (d) All of these

viii. MOV, COP, FLL, & TOD are the group of- **1**
   (a) Data flow Instructions
   (b) Data compare Instructions   1 1,3 2 1,4
   (c) Program Flow Instructions
   (d) Specific Instructions

ix. Which of the following is correct statement: **1**
   (a) PI controllers improve steady state response
   (b) PD controllers improve transient response   1 1,2 2 1,4
   (c) Both (a) and (b)
   (d) None of these

x. PID controllers are tuned on the frequency response of the closed loop system by- **1**
   (a) Using the open loop gain corresponding to marginal stability   1 1,2 2 1,2
   (b) Using the maximum amplitude of response
   (c) Using maximum value of phase
   (d) Using minimum value of phase

Q.2 i. Write short notes on fixed input/output and modular input/output. **2**   1 1 1 1,2

ii. List & describe each major part of PLC architecture. **3**   2 1,3 1 1,2

iii. Explain in detail the ladder diagram rule with suitable example. **5**   3 1,3 2 1,2

OR iv. Discuss all the elements of the PLC input module layout using a suitable diagram. **5**   2 1,3 1 1,2

Q.3 i. Explain the working of NO and NC contacts using a suitable example. **2**   2 1,3 2 1,2

ii. Explain the characteristics of PLC registers. **8**   2 1,3 2 1,2

OR iii. Explain the following instructions of the PLC: **8**
   (a) XIO   (b) XIC   3 1,3 2 1,4
   (c) OUTB   (d) AND

Q.4 i. Explain any three mathematical arithmetic functions. **3**   2 1 3 1,2

ii. Define PLC counter. Draw the symbol of UP and DOWN Counters and explain about both counters in brief. **7**   2 1 3 1,4

OR iii. Illustrate PLC ON delay timer and OFF delay timer in detail. **7**   3 1,2 3 1,4

Q.5 i. Explain changing a bit using shift register. **4**   2 1,2 3 1,2

ii. Explain the following functions with their applications: **6**
   (a) Move   (b) FAL   3 1,2 2 1,4
   (c) Sweep functions

OR iii. Explain three-axis control robot with PLC. **6**   2 1,2 2 1,2

Q.6 Attempt any two:
i. Explain analog modules & systems. Draw its pin diagram. **5**   2 1,2 1 1,4

ii. Explain position indicator using PID control with neat diagram. **5**   2 1,2 2 1,2

iii. Explain Multi-bit Data Processing in PLC. **5**   2 1,2 2 1,2

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Marking Scheme
EE3EI01 (T) PLC & Applications (T)

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Q.1	i)	(b) Digital	1
	ii)	(c) Ladder Logic	1
	iii)	(a) Comparison instructions	1
	iv)	(d) C (AB + D)	1
	v)	(d) To monitor the PLC's operation and reset the PLC in case of a malfunction	1
	vi)	(a) Address	1
	vii)	c) To record data over a period of time	1
	viii)	(a) Data flow Instructions	1
	ix)	(c) Both (a) & (b)	1
	x)	(a) Using the open loop gain corresponding to marginal stability	1

Q.2	i.	Fixed input/output explanation **1M**	2
		Modular input/output explanation **1M**	
	ii.	PLC architecture diagram **1M**	3
		major part of PLC and their details **2M**	
	iii.	ladder diagram rule explanation **2M**	5
		Suitable example **3M**	
OR	iv.	Elements of the PLC input module layout **4M**	5
		Suitable diagram **1M**	

Q.3	i.	The working of NO and NC contacts **1M**	2
		Suitable example **1M**	
	ii.	PLC registers introduction **2M**	8
		Input registers **2M**	
		Output registers **2M**	
		Holding registers **2M**	

OR	iii.	(a) XIO **2M**	8
		(b) XIC **2M**	
		(c) OUTB **2M**	
		(d) AND **2M**	

Q.4	i.	Any three Arithmetic functions in PLC like, Add, Subtract, Multiply, Divide tec. **1*3 =3**	3
	ii.	PLC counter diagram and explanation **3M**	7
		PLC UP Counter **2M**	
		PLC DOWN Counter **2M**	
OR	iii.	PLC ON delay timer **3M**	7
		PLC OFF delay timer **4M**	

Q.5	i.	Shift register introduction **1M**	4
		Bit changing operation using shift register **3M**	
	ii.	Each function and its application **2*3 =6**	6
OR	iii.	Three axis control robot diagram **2M**	6
		Working and explanation **4M**	

Q.6		**Attempt any two:**	
	i.	Analog modules and systems pin diagram. **1M**	5
		Working principle and operation. **4M**	
	ii.	position indicator using PID control neat diagram **1M**	5
		position indicator using PID control working **4M**	
	iii.	Multi bit Data Processing in PLC **5M**	5

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