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**BANGALORE - 560 054**

<b>Course &amp; Branch</b>	<b>: B.E.- Electrical &amp; Electronics Engg.</b>	<b>Semester</b>	<b>: V</b>
<b>Subject</b>	<b>: Advanced Industrial Automation -I</b>	<b>Max. Marks</b>	<b>: 100</b>
<b>Subject Code</b>	<b>: EEPE34</b>	<b>Duration</b>	<b>: 3 Hrs</b>

- Answer one full question from each unit.

- |    |    |   |     |      |
|----|----|---|-----|------|
| 1. | a) | Draw the circuit diagram to implement OR logic gate using relays                                    | CO1 | (06) |
|    | b) | For the following Boolean expression  | CO1 | (08) |
|    |    | $X = A + (B \cdot (\bar{A} + C) + C) + A \cdot B \cdot (\bar{D} + \bar{E})$                         |     |      |
|    |    | i) Write the ladder logic for the un-simplified equation  |     |      |
|    |    | ii) Simplify the equation   |     |      |
|    |    | iii) Write the ladder logic for the simplified expression.  |     |      |
|    | c) | Define the term "Solenoid".   | CO1 | (06) |
| 2  | a) | Simplify the following boolean expression and implement the simplified equations with ladder logic. | CO1 | (06) |

$$X = \overline{\overline{(A \cdot \bar{B} \cdot C) + B} \cdot B \cdot (A + \bar{C})}$$

Outputs						Inputs
F	E	D	C	B	A	
0	1	0	1	0	1	Input X on
1	0	0	0	0	1	Input X on
0	1	0	1	1	1	Input X on

- |    |    |   |     |      |
|----|----|---|-----|------|
| 3. | a) | Draw a circuit diagram to show sinking input module/sourcing input device.  | CO2 | (05) |
|    | b) | List the factors to be considered while selecting Digital input module      | CO2 | (05) |
|    | c) | Write a short note on IEC61131 standards.                                   | CO2 | (10) |
| 4. | a) | Mention the steps involved in converting an analog signal to binary format. | CO2 | (06) |
|    | b) | Explain in detail RTD input module.   | CO2 | (07) |
|    | c) | With a neat block diagram, explain the AC output circuits.                  | CO2 | (07) |



# EEPE34

## UNIT - III

5. a) Design the ladder logic for the following specifications: CO3 (08)  
When PB1 (start push button) is pressed the box conveyor moves. Upon detection of box present, the box conveyor stops and the apple conveyor start. Part sensor will count for 5 apples. Apple conveyor stops and box conveyor starts again. Counter will be reset and operation repeats until PB2(stop push button) is pressed.
- b) Develop a ladder program that will latch on an output B, 20 seconds after input A has been turned on. The timer will continue to cycle up to 20 seconds, and reset itself, until input A has been turned off. After the third time, the timer has timed to 20 seconds, the output B will be unlatched. CO3 (08)
- c) Define Master Control Relay. CO3 (04)
6. a) Write a program that will turn on a flashing light for the first 15 seconds after a PLC is turned on. The light should flash for half a second on and half a second off. CO3 (06)
- b) Using Twido suite software instructions, write a program to achieve the following : CO3 (08)  
A motor will be controlled by two switches. The *Go* switch will start the motor and the *Stop* switch will stop it. If the *Stop* switch was used to stop the motor, the *Go* switch must be thrown twice to start the *motor*. When the *motor* is active a *light* should be turned on. The *Stop* switch will be wired as normally closed.
- c) Explain counter instructions. CO3 (06)

## UNIT - IV

7. a) Explain the recommended procedure for I/O wiring CO4 (08)  
b) With a neat diagram, explain the layout of the PLC panel CO4 (12)
8. a) Write short notes on special I/O connections. CO4 (08)  
b) Explain the significance of PLC documentation. CO4 (06)  
c) Briefly explain 'wire bundling' process. CO4 (06)

## UNIT - V

9. a) Mention the five levels of SCADA system. CO5 (05)  
b) List all the communication interfaces of modern RTU. CO5 (06)  
c) Describe Master Terminal Unit. CO5 (09)
10. a) Mention the features of SCADA. CO5 (08)  
b) Explain the generic software architecture of SCADA with relevant diagram. CO5 (12)

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