



**B.E DEGREE EXAMINATIONS: MAY 2017**

(Regulation 2014)

Sixth Semester

**ELECTRONICS AND INSTRUMENTATION ENGINEERING**

U14EIT603: Advanced Industrial Controllers

**COURSE OUTCOMES**

- CO1:** Describe the architecture of PLC.  
**CO2:** Understand the working of PLC analog input and output devices.  
**CO3:** Program on basic ladder logic diagram using timer and counters.  
**CO4:** Understand the interface of PC with PLC.  
**CO5:** Describe the study of SCADA system.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-  
PART A (10 x 1 = 10 Marks)**

1. Match the following categories of PLC and Manufactures.

CO1 [K<sub>1</sub>]

List I		List II	
A. AB		i. GE Fanuc	
B. ABB		ii. Siemens	
C. Versa Pro		iii. AC1131	
D. Simatic Manager		iv. Rockwell automation	

- |    | A   | B   | C   | D  |
|----|-----|-----|-----|----|
| a) | ii  | i   | iii | iv |
| b) | iii | iv  | ii  | i  |
| c) | ii  | iv  | iii | i  |
| d) | iv  | iii | i   | ii |

2. Which of the following is the output instruction that can be used to set accumulated value of timer or counter to zero

CO3 [K<sub>2</sub>]

- |        |         |
|--------|---------|
| a) CLR | b) SKIP |
| c) CTU | d) CTR  |

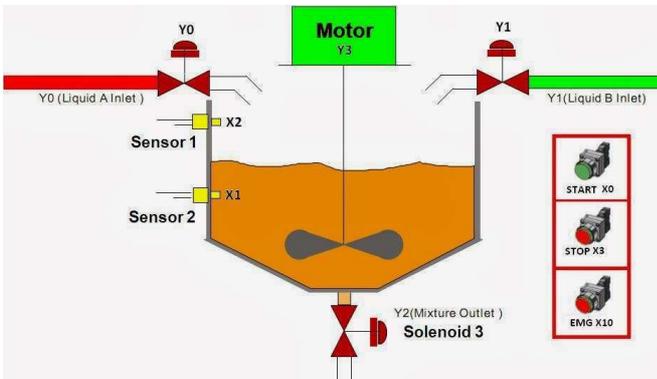
3. Which of the following statements is not correct?

CO2 [K<sub>2</sub>]

- 1) The PLC rung output [-(-)] is a discrete output instruction or bit in memory.
- 2) Each rung of the ladder logic represents a logical statement executed in software - inputs on the right and outputs on the left.
- 3) Input and output instructions in ladder logic do not directly represent the switches and actuators.
- 4) PLC input instructions are logical symbols associated with voltage at the input module terminals.

- |        |        |
|--------|--------|
| a) 1,3 | b) 4   |
| c) 2   | d) 2,3 |

4. The latch and unlatch instructions would be classified as CO3 [K<sub>1</sub>]  
 a) Non-retentive outputs b) Retentive outputs  
 c) Conditional instructions d) Unconditional instructions
5. Assertion (A): In PLC the timer-timing bit is true CO3 [K<sub>2</sub>]  
 Reason (R): The accumulated value of the timer is
- a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A  
 c) A is true but R is false d) A is false but R is true
6. The process of scanning the channels to read the data by the microprocessor is called CO1 [K<sub>1</sub>]  
 a) Data acquisition b) Logging  
 c) Polling d) Supervising
7. Arrange the following sequence of actions according to Process and Ladder logic execution. CO4 [K<sub>3</sub>]



1 X1 & X2 signal reads

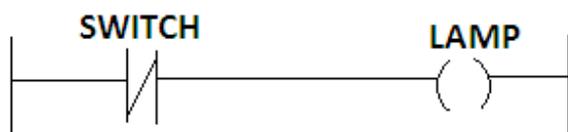
2. Motor Y3 START

3. Value Y0 & Y1 Open

4. Value Y2 Open

- a) 2-3-4-1 b) 1-3-2-4  
 c) 3-4-2-1 d) 4-1-3-2

8. The type of relay circuits which are usually rated between 5 to 10 A and a coil voltage of 120V ac is CO2 [K<sub>1</sub>]  
 a) Contactors b) Control relays  
 c) Motor starters d) Interposing relays
9. The simple ladder logic figure shown in below CO2 [K<sub>3</sub>]



Assertion (A): The lamp does not glow

Reason (R): There is an electrical path through NC Contacts

- a) Both A and R are Individually true and R is the correct explanation of A      b) Both A and R are Individually true but R is not the correct explanation of A  
c) A is true but R is false      d) A is false but R is true

10. Choose which one is the SCADA tool in the following CO5 [K<sub>1</sub>]  
a) In-touch      b) Keyence  
c) micrologix      d) RS logix

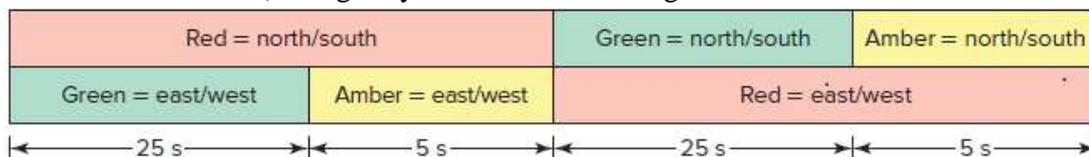
**PART B (10 x 2 = 20 Marks)**  
**(Answer not more than 40 words)**

11. Compare PLC & Relay? CO1 [K<sub>2</sub>]  
12. Draw a ladder logic to switch ON a cooling motor for five minutes, when a metal cutting operation is started and continue it for another 5 minutes after the operation is stopped CO3 [K<sub>3</sub>]  
13. Recall the I/O modules and Devices of PLC CO2 [K<sub>1</sub>]  
14. List out the different Programming Language of PLC and give example for any two. CO2 [K<sub>2</sub>]  
15. Illustrate manually operated and mechanically operated switches by their symbols. CO3 [K<sub>2</sub>]  
16. Explain about troubleshooting and maintenance of PLC. COL [K<sub>2</sub>]  
17. Develop a ladder logic program for automatic ON & OFF control of water tank level system CO4 [K<sub>3</sub>]  
18. Illustrate the analog operation in PLC. CO4 [K<sub>L</sub>]  
19. List out a few applications of SCADA system. CO5 [K<sub>L</sub>]  
20. Write in brief about data acquisition system. CO5 [K<sub>2</sub>]

**Answer any FIVE Questions:-**  
**PART C (5 x 14 = 70 Marks)**  
**(Answer not more than 300 words)**

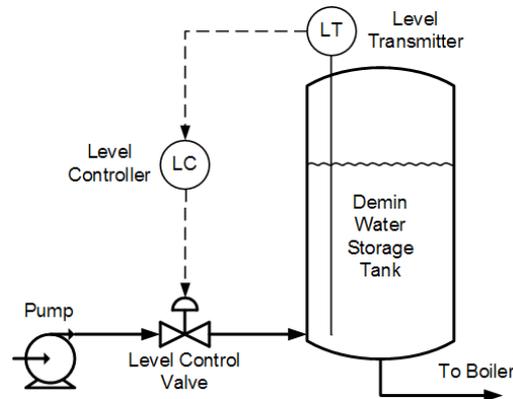
**Q.No. 21 is Compulsory**

21. Explain the basic principles of operation of PLC & Its architecture with neat diagram CO1 [K<sub>2</sub>]  
22. Illustrate the functions of the A/D converter circuits used in analog input modules CO2 [K<sub>2</sub>]  
23. Create a PLC ladder logic program for control of traffic lights in two directions (East-West & North-South) using only 4 timers. The timing chart is indicated below CO3 [K<sub>3</sub>]

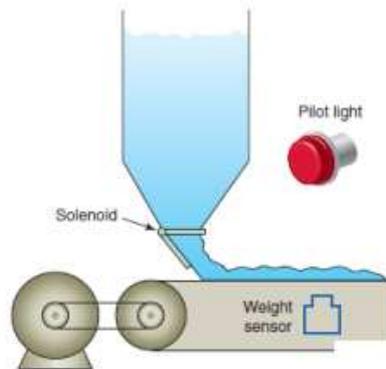


24. Illustrate the different types of counters with suitable examples. CO2 [K<sub>2</sub>]  
25. Discuss in detail about Human machine Interface used in SCADA. CO5 [K<sub>2</sub>]

26. (i) Demonstrate the PID block operations involved in PLC. (8) CO4 [K<sub>2</sub>]  
(ii) Build a Ladder logic to maintain the liquid level of tank using PID block (6) CO4 [K<sub>3</sub>]



27. (i) Discuss In detail about the master control reset instructions. (4) CO4 [K<sub>2</sub>]  
(ii) Develop a ladder logic program for the conveyor using subroutine instruction. (10) CO4 [K<sub>3</sub>]



A materials conveyor system with a flashing pilot light(PL).

If the weight on the conveyor exceeds a preset value, the solenoid is de-energized and pilot light PL will begin flashing.

Conditions:

1. When the weight sensor switch closes, the JSR is activated and directs the processor scan to jump to the subroutine
2. The subroutine program is scanned and pilot light PL begins flashing.
3. When the weight sensor switch opens, the processor will no longer scan the subroutine area and pilot light PL will return to its normal on state.

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