

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: IMGT302 / Industrial Automation
Program: B.Tech Electronics Engineering
Time: 03 hrs.

Semester: VIII

Max. Marks: 100

Instructions:

Mention the PLC make and model used for programming.

Take assumption as per your convenience, also mention it.

Marks Distribution:

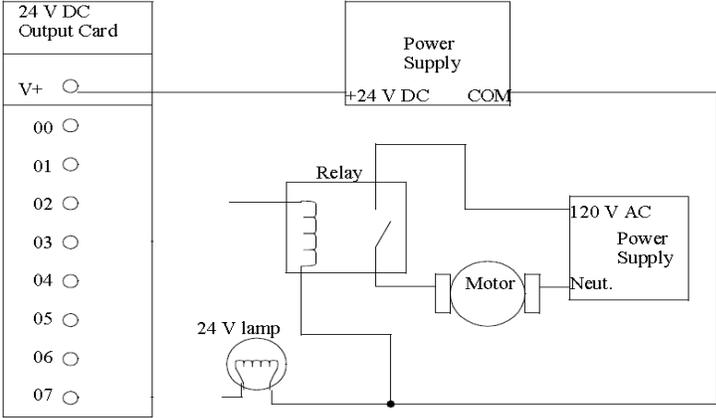
Section A: 20 Marks

Section B: 40 Marks

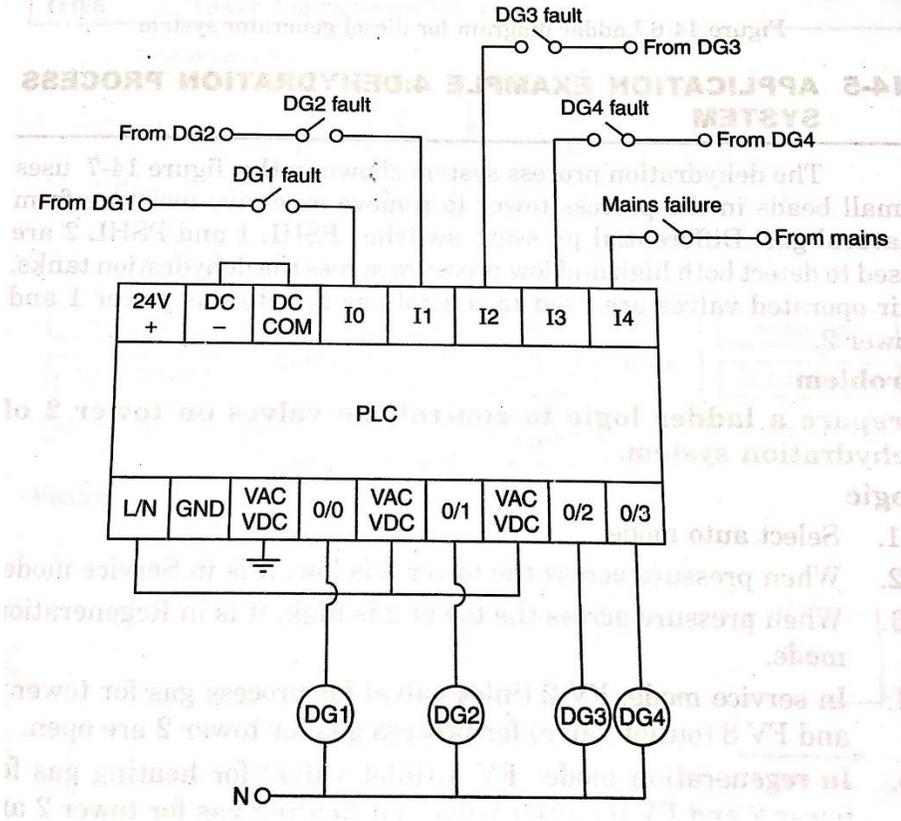
Section C: 40 Marks

SECTION A

S. No.		Marks	CO
Q 1	<p>From the below given figure, connect the control wires for the following ladder logic cases:</p> <p>a.</p>  <p>b.</p> 	5	CO1,2

			
Q2	Differentiate between real time and historical trends.	5	CO1,3
Q3	Can we provide help about specific alarms that the operators can access easily?	5	CO1,3
Q4	<p>Answer the following with justification:</p> <ol style="list-style-type: none"> Can automation systems, like a DCS, communicate using industry standard Communication drivers like Modbus? True/ False Can the SCADA system do multiple applications and use the same Historian? True/ False SCADA stands for _____. Electronic buses are used for _____ with field devices. PLC stands for _____. 	5	CO1,2,3,4
SECTION B			
Q 5	PLC programming has some additional features as compared to relay logic. One of them is the inclusion of timers and counters. Elucidate the various timers and counters available in PLC's.	10	CO3,4
Q6	Explain the significance of telemetry in SCADA system? Name various modes of data transmission available for data transmission.	10	CO3,4
Q7	<p>The diesel generator set systems wiring diagram is shown below. It employs four DG's. The global objective is that when there is a mains failure out of four DG's on two DG's.</p> <p>Develop a PLC program to implement the following control function:</p> <ol style="list-style-type: none"> The system keeps monitoring the mains failure input When mains fail the DG1 and DG3 starts automatically In case there is a fault in DG1 then DG2 starts automatically Similarly in case there is fault in DG3 then DG4 starts automatically In case there is fault in DG3 or DG4 the respective DG stops In case DG2 is running and the fault in DG1 is cleared, then DG2 shall stop and DG1 shall start automatically. 	10	CO3,4,5

g. Similarly in case DG4 is running and the fault in DG3 is cleared, then DG4 shall stop and DG3 shall start automatically.



Q8 Consider a city gas distribution system having following configuration:

- Storage and distribution facility at city gate (centralized storage facility) where SCADA master unit will also be located.
- 1500 individual household units.
- 50 commercial units.
- Master nodes for each 100 household units and 10 commercial units respectively.

Design a SCADA system along with the detailed architecture of the system so as to highlight the functioning of each and every component.

- Suggest how the system can be made more redundant.
- Explain various communication modes and medium with various remote units.

10

CO3,4,5

SECTION-C

Q 9 During a factory automation process, a special type of Robot is been used (shown below).

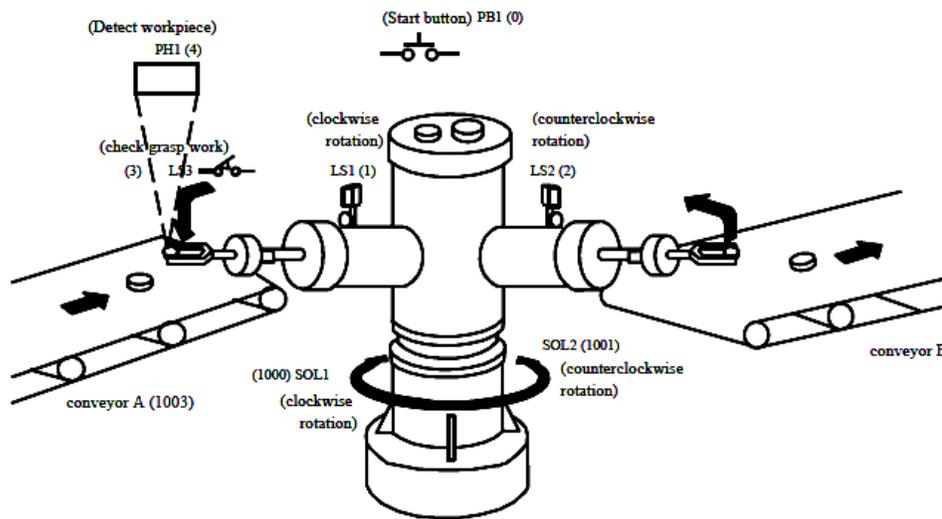
20

CO4,5

As is apparent from the figure, this robot picks up a work being carried on conveyor A, and places it on conveyor B. The robot performs one operation at a time when a given condition is met. It operates as follows:

- When the start button is pressed, the robot rotates its arm clockwise.
- When the robot arm has moved to the position of the work in conveyor A, the arm grasps the work.
- When the arm has grasped the work, it rotates counterclockwise.
- When the arm has rotated to the position of conveyor B, it releases the work.

Write a PLC program to do so.



Q10

During a factory automation process, a special type of filling/ draining system is been used (shown below).

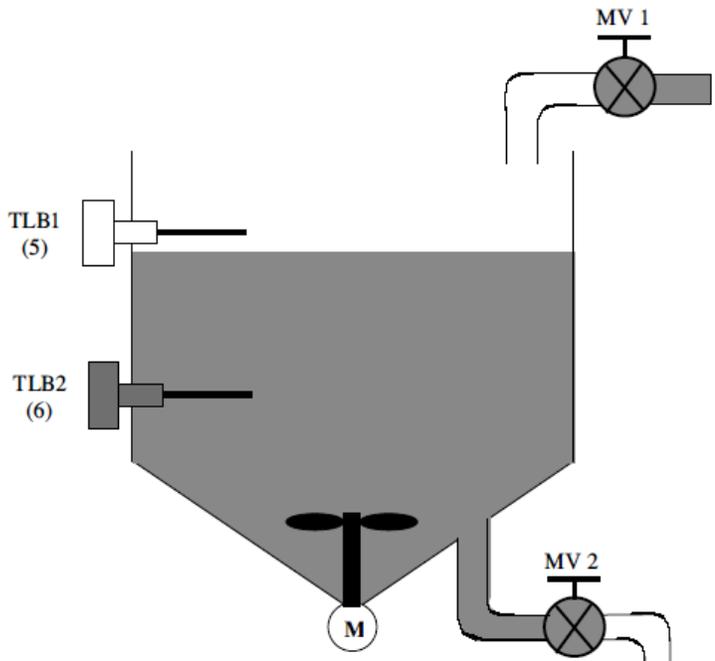
As is apparent from the figure, It operates as follows:

- As the PB1 is pressed, MV1 opens and the water begins to fill the tank. At the same time, the stirring motor M starts operations.
- When the water level passes TLB2 and reaches TLB1, the MV1 closes and the stirring motor stops.
- Next, MV2 opens and starts draining the water. When the water levels drop below TLB2, MV2 closes.
- When the cycle of operation has repeated four times, the operation END indicator illuminates, and the filling and draining operation will not restart even if PB1 is pressed.

Write a PLC program to do so.

20

CO4,5



Control Panel

PB1 (0)		START
PB2 (1)		STOP
PB3 (2)		RESET
PL (1004)		END
BZ (1005)		BUZZER

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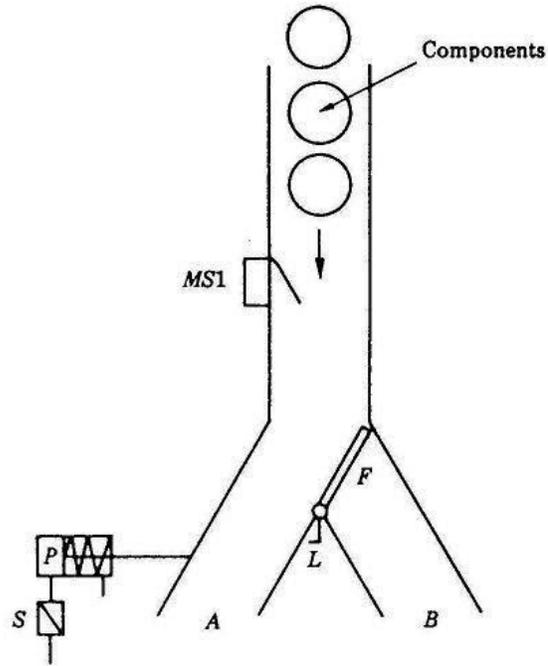
Section C: 40 Marks

SECTION A

S. No.		Marks	CO
Q 1	Elucidate the primary difference between “Timers” and “Retentive Timers” in PLC.	5	CO1,2
Q2	What is the need of Data Acquisition systems?	5	CO1,3
Q3	What are the cyber threats on SCADA systems and what are the probable precautions against them.	5	CO1,3
Q4	Differentiate between real time and historical trends.	5	CO1,3

SECTION B

Q 5	Explain in brief various reasons of failure of SCADA system.	10	CO2,4
Q6	Explain the architecture of SCADA system and explain in brief.	10	CO2,4
Q7	As per your own discretion, consider any local industry process where a PLC and SCADA might be installed. List and describe what environmental factors must be considered before installing the PLC and SCADA system for control of this process.	10	CO3,4
Q8	A Batch Machine, which is been controlled by PLC. It counts and batches components moving along a conveyor. It is required that ten components be channeled down route A and twenty components down route B. A reset facility is required for emergency stop purpose. Develop a ladder logic program to do so.	10	CO4,5



SECTION-C

Q 9	Design the PCD and CCD to control the forward and reverse motion of a 3-phase induction motor, considering switching of reverse operation after 5 sec of forward switching. Also, develop the ladder logic of the same.	20	CO4,5
Q10	Develop a PLC program to generate a square wave pulse of the following order: ON Time of the wave = 6 sec OFF Time of the wave = 4 sec For 10 cycles.	20	CO4,5