



COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical and Control Engineering

Lecturer : Dr. Mostafa Abdel-Geliel

Course : Automated Industrial System I

Course Code: EE 512

Time : 2 hours

Marks: 40

Date : 12 /1 / 2015

Final Exam

(Q1) (10 marks) (A.8,A.12,C15,D7)

- Explain the timer types in Siemens PLC and give an example for each.
- Compare between hardwire and programmable logic controller in automation system design.
- Discuss the main family of Siemens PLC and its module arrangements.

(Q2) (12 marks) (A.4,A.20,A.27,A.28, B.3, B.15.C.2,C.3,C.15,C.20,D.4)

- Describe the function of hardwire circuit shown in Fig.1, then convert it to the corresponding logic circuit and ladder.

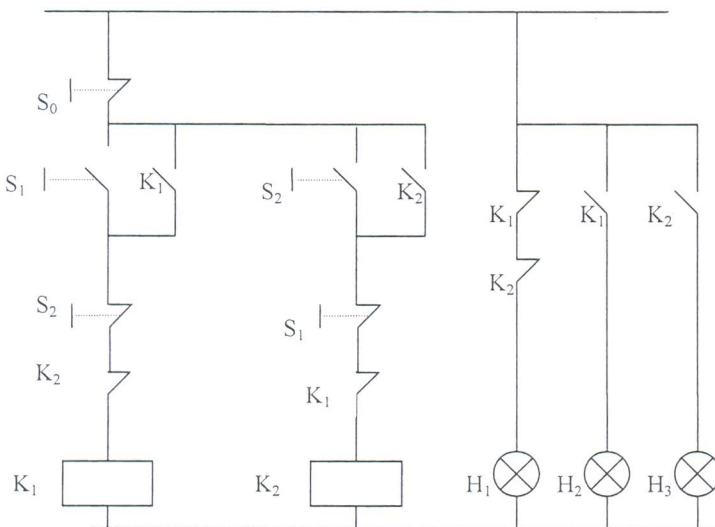


Fig. 1

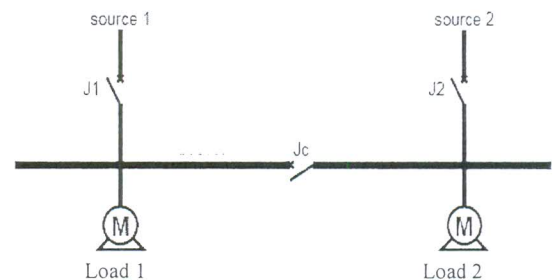


Fig. 2

- Try to design the control circuit, using hardwires and PLC, of a substation has the single line diagram as shown in Fig. 2. The system operates as two different sources with two different loads in normal situation. While it works as automatic transfer switch if one of the two feeders does not serve. The operation is summarized in the following Table

Source 1	Source 2	J1	J2	Jc
ok	ok	on	on	off
ok	non	on	off	on
non	ok	off	on	on
non	non	off	off	off

Note: to avoid the transition overlap from one state to another, a time delay of 5 s should be performed before switches change.

where J1, J2, and Jc are circuit breakers of source 1, source 2 and bus-coupler

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(Q3) (8 marks) (A.4,A.20, A.28, B.3, B.8,D.4)

Design a plc program to a traffic light control that operate 3 lamps (green, yellow and red) serially; the green operates after start (input I0.0) for 30s, the yellow operates after green for 5s and the red operates for 20s after yellow. The sequence will be repeated until stop (I0.1) is activated. Draw the timing diagram.

Write the PLC program in Ladder, FB (Function Block), SL(Statement List), and SFC (Sequential Flow Chart)

(Q4) (10 marks) (A.2,A.5,A.28, B.2,B.10,B.15, C.15,C.17, D.6)

An automatic liquid pouring system is illustrated in the schematic diagram shown in Fig. 3. The control objective of the system is carried out according the following:

- 1- After starting operation a conveyor belt moves to transfer bottle under the filling tank.
- 2- If the bottle is detected using bottle sensor, the conveyor will be stopped.
- 3- Tank outlet valve is opened for 5 seconds to fill the bottle.
- 4- Conveyer belt moves again to bring another bottle to be filled.
- 5- If the stop button is activated during bottle filling, the system stops after finishing the filling stage otherwise it stops directly.
- 6- If an emergency stop is activated the system stop instantaneously.
- 7- The tank level should be monitored using up and down level sensors
- 8- System stop and a buzzer is operated if the level of the tank is below the low level
- 9- Indication lamps for the filling capacity are energized as follow:
 - a- A green lamp is energized during normal operation
 - b- A red lamp is energized after stop
 - c- A yellow led will be on if the number of bottles is higher than 10.
 - d- A flasher will be ON with frequency 1 Hz if the number of bottles is higher than 25 bottles.

It is required to

1. Determine the input/output signal connected to PLC.
2. Draw the connection diagram.
3. Design programs in ladder that achieve the required sequence.

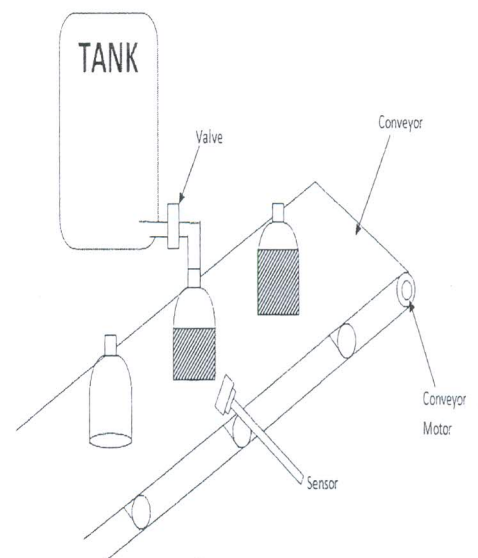


Fig. 3

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