



Question 1 (25 Marks) :

a - Write short notes on:-

- Criteria for choosing PLC.
- PLC programming languages.

(6 Marks)

b- Explain the main differences between PLC and PC, and then explain with drawing its architecture.

(9 Marks)

c- Draw a ladder diagram for the following logic function

$$F = \sum (1,2,3,5,7,10)$$

(10 Marks)

Question 2 (25 Marks) :

a- Write a simulation program for each of the following function blocks:-

- Pulse timer.
- Up/ Down counter

(10 Marks)

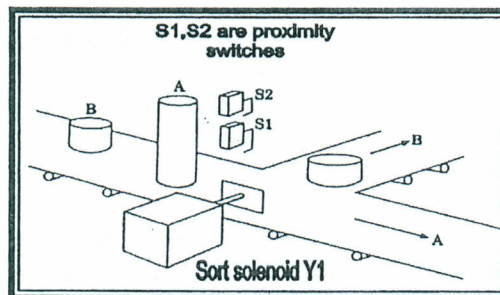
b- Explain the theory of operation of the following input devices:

- Proximity switches.
- Photo electrical switches.

(6 Marks)

c- Draw ladder diagrams for the following:-

- On delay timer .
- 10-bit shift register .
- 6 channels analog multiplexer.



(9 Marks)

Question 3 (25 Marks) :

a- Design a ladder diagram for component detection and sorting process shown.

(5 Marks)

b- Draw a ladder diagram to simulate 3 stages process control system, the first one takes 5 min., the second one takes 3 min., and the third one takes 15 min., and repeat.

(6 Marks)

c- A wood saw, a fan and a lube pump, all go on when a start button is pushed. A stop button stops the saw only. The fan is to run an additional 5 seconds to blow the chips away. The lube pump is to run for 8 seconds after shutdown of the saw. If the saw has run less than one minute, the lube pump should go off when the saw is turned off, and the 8 seconds time delay off does not take place. Additionally, if the saw has run more

than one minute, the fan should stay on indefinitely, and may be turned off by pushing a separate fan reset button.

- i- Illustrate a PLC timing diagram, and then draw the ladder diagram.
- ii- Convert this ladder into IL program format.

(9 Marks)

Question 4 (25 Marks) :

a- Device a ladder diagram to simulate half adder.

(5 Marks)

b- Device a ladder diagram to control a pick and place Gripper unit of robot arm.

(6 Marks)

c- Device a ladder diagram program to control which of the lamps H1 or H2 is to be switched on according to the state of the selection switch A . H1 is switched on if A=0, H2 is switched on if A=1. The lamp selected can be switched off with push button B.

(9 Marks)

❖ Good Luck ❖