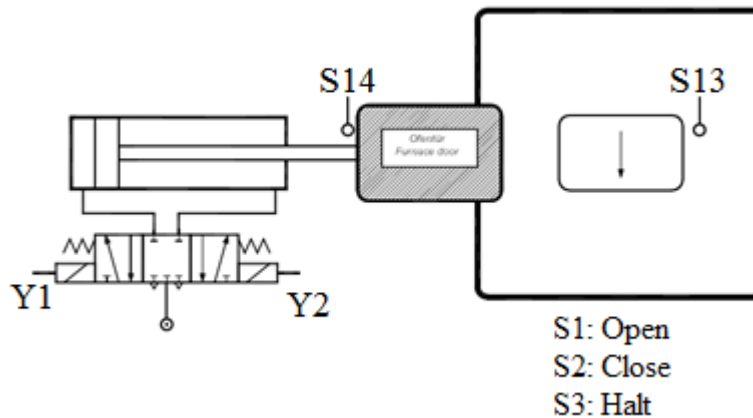

Question (1) [30 Marks]

- A) State the advantages and the disadvantages of using the PLC.
- B) State the difference between the digital and analog input and give an example for each one.
- C) State how we could use the counter of the PLC to measure lengths.
- D) A furnace door is controlled by means of directional control valve as shown in the following figure and descriptions:



In its initial position, the furnace door is closed. Pressing switch S1 triggers solenoid valve Y2 to open the door. Limit switch S14 or stop switch S3 deactivate solenoid valve Y2. If the furnace door has been stopped by limit switch S14 or stop switch S3, the door is closed automatically by solenoid valve Y1 after a delay of 6 seconds. The closing procedure can also be commenced by means of button S2. Stop button S3 can be used to halt the closing of the door. If a total opening time of 30 seconds is exceeded through repeated operation of the stop button, this button is disabled and the furnace door closes automatically. Closing of the door is completed by deactivating solenoid valve Y1 when limit switch S13 is reached. The movements of the door must be mutually interlocked.

Create an assignment list of the inputs and the outputs, draw up a terminal diagram, and write a PLC program in ladder diagram mode.



Academic Number:

Question (2) [15 Marks]

- A) State the difference between the digital and analog output and give an example for each one.
- B) By using two timers, a lamp flickers periodically for 1 second while the switch s1 is on. The lamp stops to flicker if switch s1 is off. Determine the type of the switch, create an assignment list of the inputs and the outputs, draw up a terminal diagram, and write a PLC program in ladder diagram mode.

Question (3) [15 Marks]

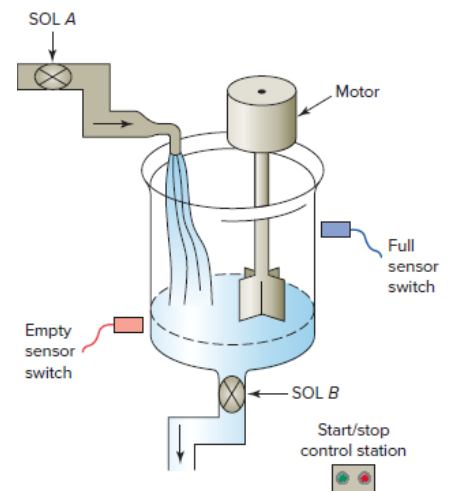
There are 4 motors controlled by PLC. Whenever the push-button PB1 is pressed, the numbers of operating motor is increased by 1. The PB2 decreases the numbers of operating motor by 1 whenever it is pressed. If the PB1 is pushed when the 4 motors are operating, all motors will stop their operation. When the PB3 (emergency stop) is pressed then all motors stop. Create an assignment list of the inputs and the outputs, draw up a terminal diagram, and write a PLC program in ladder diagram mode.

Question (4) [10 Marks]

Write a program to implement the process illustrated in the illustrated figure.

The sequence of operation is to be as follows:

- Normally open start and normally closed stop pushbuttons are used to start and stop the process.
- When the start button is pressed, solenoid A energizes to start filling the tank.
- As the tank fills, the empty level sensor switch closes.
- When the tank is full, the full level sensor switch closes, and the Solenoid A is de-energized.
- The agitate motor starts automatically and runs for 3 min to mix the liquid.
- When the agitate motor stops, solenoid B is energized to empty the tank.
- When the tank is completely empty, the empty sensor switch opens to de-energize solenoid B.
- The start button is pressed to repeat the sequence.



With my best wishes
Dr. Sherif Imam