

Question (1) [30 Marks]

A) State the advantages and the disadvantages of using the PLC.

The advantages

- Smaller physical size than hard-wire solutions.
- Easier and faster to make changes.
- PLCs have integrated diagnostics.
- Applications can be immediately documented.
- Applications can be duplicated faster and less expensively.
- Cost effective for controlling complex systems.
- Flexible and can be reapplied to control other systems quickly and easily.
- Computational abilities allow more sophisticated control.
- Trouble shooting aids make programming easier and reduce downtime.
- Reliable components make these likely to operate for years before failure.

The disadvantages

- Newer Technology.
- Environmental Considerations
- Fail-Safe Operation Fixed-circuit Operation

B) State the difference between the digital and analog input and give an example for each one.

The digital inputs are these inputs which have the state on or off only, such that : start stop switches.

The analog inputs are these inputs with continuous signals such as temperature sensors.

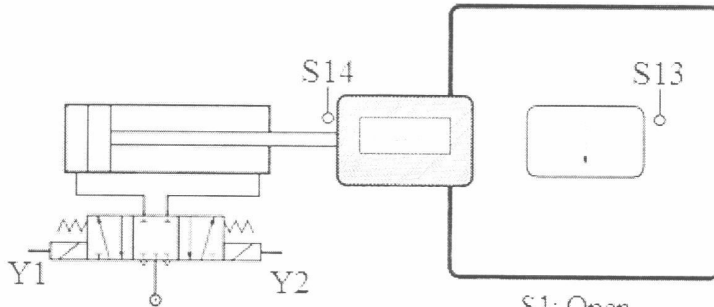
C) State how we could use the counter of the PLC to measure lengths.

With the help of shaft encoder and by knowing its diameter we can use it for measuring lengths.



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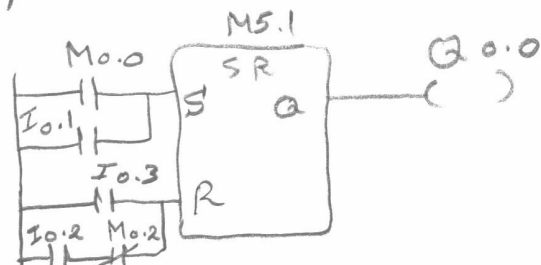
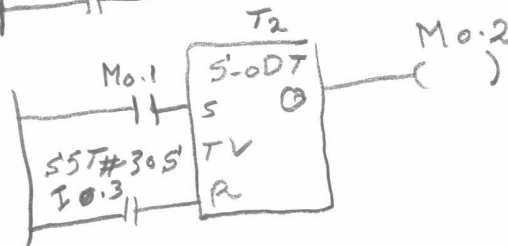
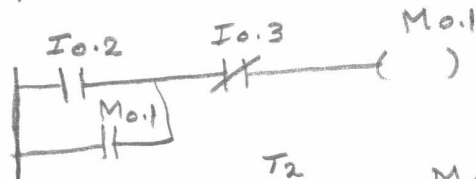
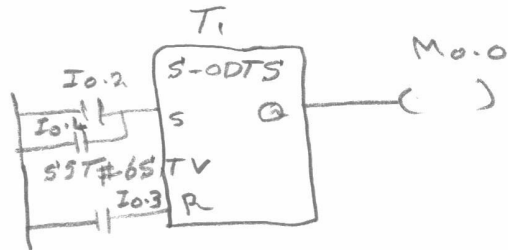
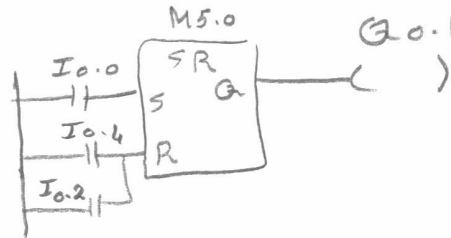
D) A furnace door is controlled by means of directional control valve as shown in the following figure and descriptions:

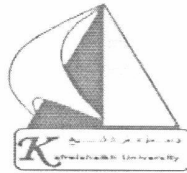


S1: Open
 S2: Close
 S3: Halt

S1 → I0.0
 S2 → I0.1
 S3 → I0.2
 S13 → I0.3
 S14 → I0.4

Y1 → Q0.0
 Y2 → Q0.1





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Question (2) [15 Marks]

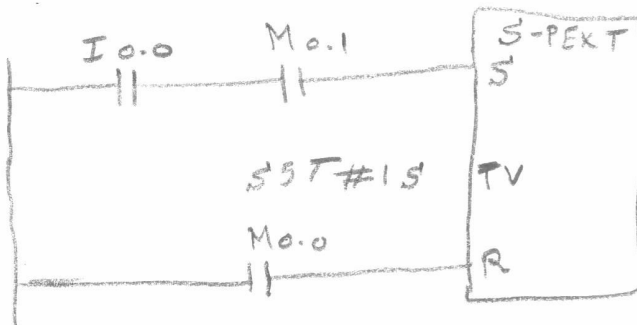
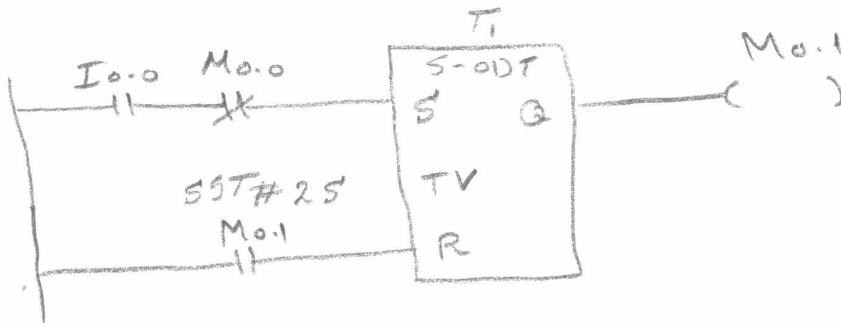
A) State the difference between the digital and analog output and give an example for each one.

Digital output is the output which has two states only on or off such as the start / stop of a motor.

Analog output is the output with continuous signals such as controlling the speed of a motor.

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.

$S_1 \rightarrow I_{0.0}$
 Lamp $\rightarrow Q_{0.0}$



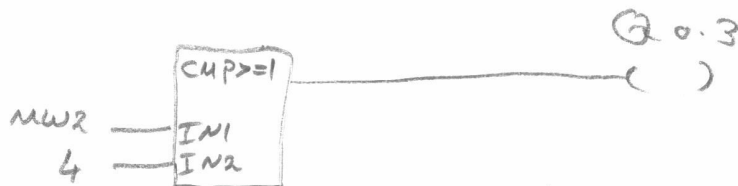
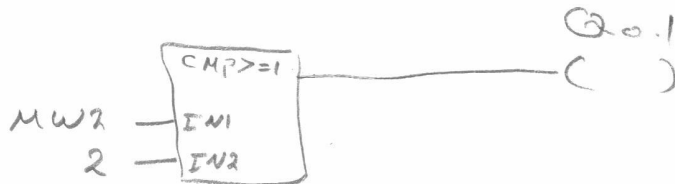
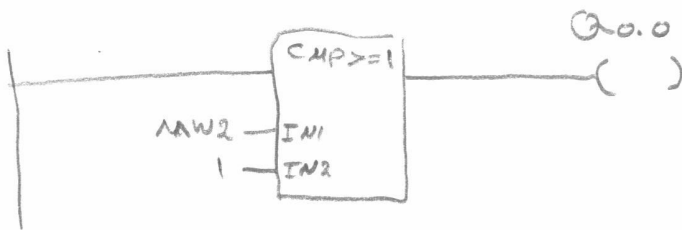
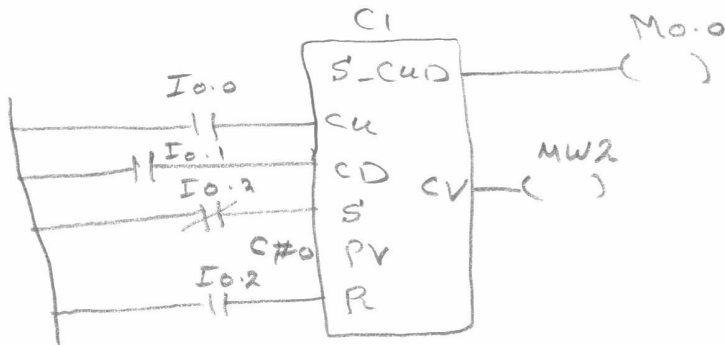


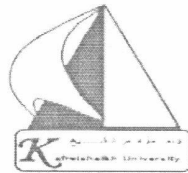
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Question (3) [15 Marks]

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 a terminal diagram, and write a PLC program in ladder diagram mode.

PB1 → I0.0 M1 → Q0.0
 PB2 → I0.1 M2 → Q0.1
 PB3 → I0.2 M3 → Q0.2
 M4 → Q0.3





Question (4) [10 Marks]

N.O start I0.0 solA → Q4.0
 N.O stop I0.1 solB → Q5.0
 Full I0.2 Muxer2 → Q4.1
 Empty I0.3

