Tutorial 2 Solution

ET0917 / ET0817 / ET0832

WATCH THE VIDEO TO ATTEMPT QUESTION 1 – 5

https://youtu.be/K4C6xLDHLvw

Q1 - MCQ

The PLC engineer needs to understand _____ such as sensors.

a) I/O devices

b) flowcharts

c) program

d) commission

Q2 - MCQ

The PLC engineer needs to know how to _____ I/O devices to the PLC modules.

a) flowcharts

b) interface

c) program

d) commission

Q3 - MCQ

The PLC engineer needs to _____ a suitable PLC and I/O modules.

a) design

b) program

c) commission

d) select

Q4 - MCQ

The PLC engineer would usually convert customer's requirement into a _____ in order to provide clarity for programming.

a) design

b) program

c) flowchart

d) interface

Q5 - MCQ

The PLC engineer needs to _____ the completed system, which includes testing and fine-tuning of the PLC program to meet customer's requirement.

a) commission

b) program

c) select

d) interface

Q6- MCQ

How do we assign the address prefix of the PUSH BUTTON connected to the PLC?

a) %I

b) %Q

c) %M

d) %DB

| File Type	
I	Input
Q	Output
M	Bit Memory
DB	Data block

Q7- MCQ

When would we use %M memory bit/byte addressing?

a) When addressing PLC physical input (sensor/ push button etc)

b) When addressing PLC physical output (LED/buzzer etc)

c) When addressing logic without physical connection to input/output

d) When addressing inputs from remote I/O

Q8- MCQ

What is the logic gate corresponding to the ladder diagram?

a) NOR Logic

b) AND Logic

c) Exclusive OR Logic

d) Exclusive NOR Logic
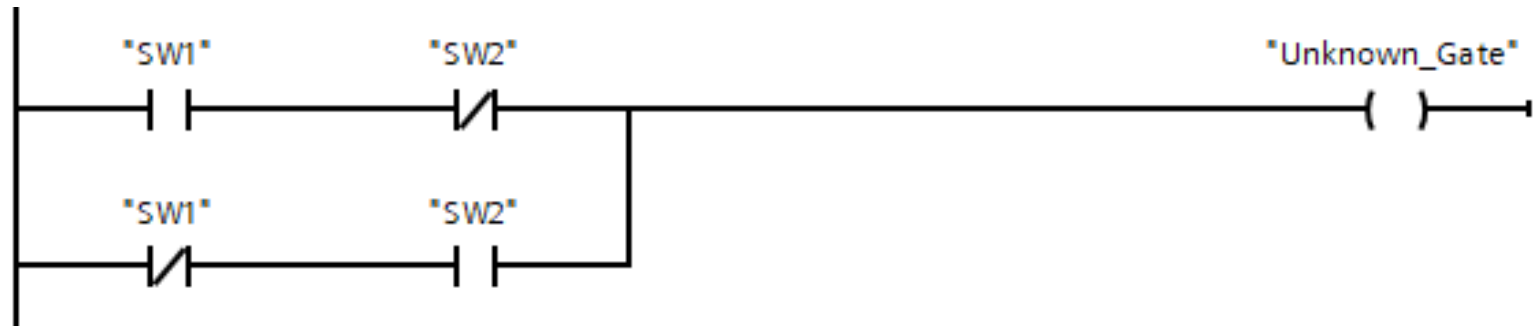
Q8A- MCQ

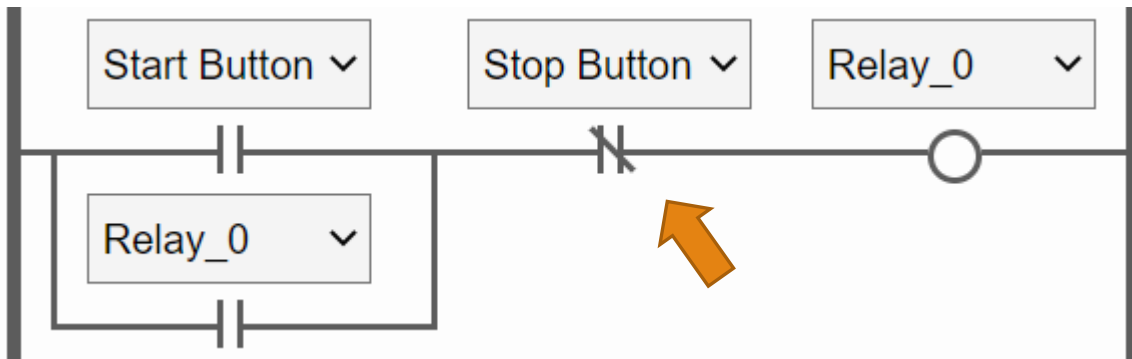**Select one or more** TRUE statements about the following circuit?

❑ a) Briefly pressing Start_Button will permanently ON Relay_0

❑ b) It is a self latching circuit

❑ c) There is no way to reset Relay_0

❑ d) Relay_0 should not be used twice in the same ladder
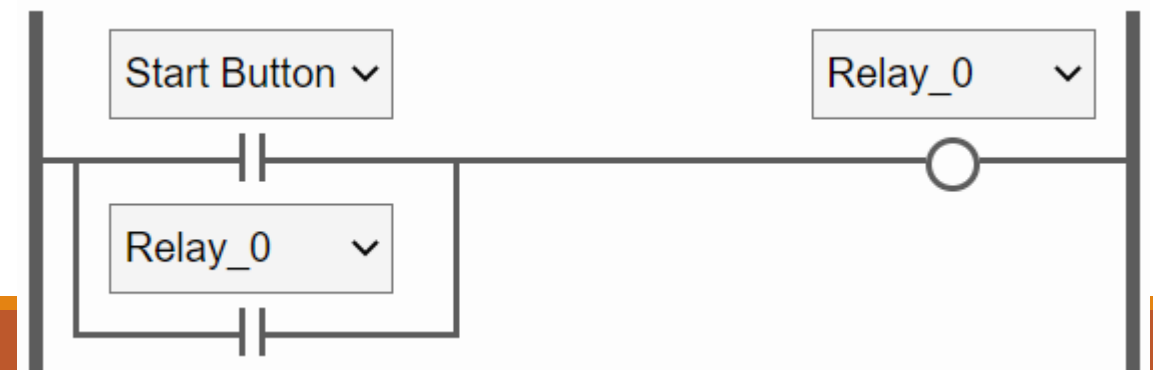
Q8B- MCQ

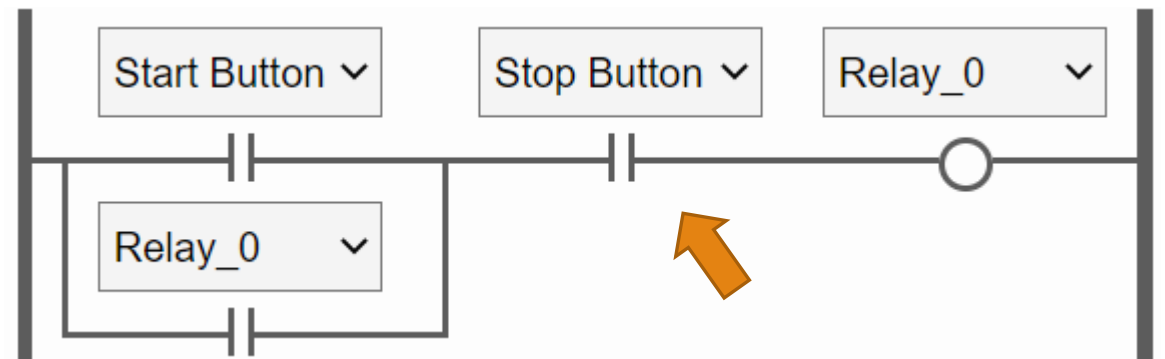Which PLC ladder program will work properly if a physical **N.O.** stop_button is provided.

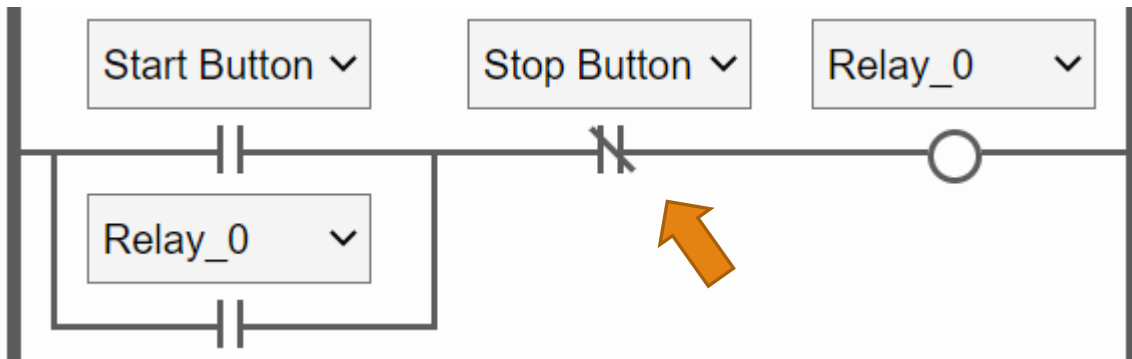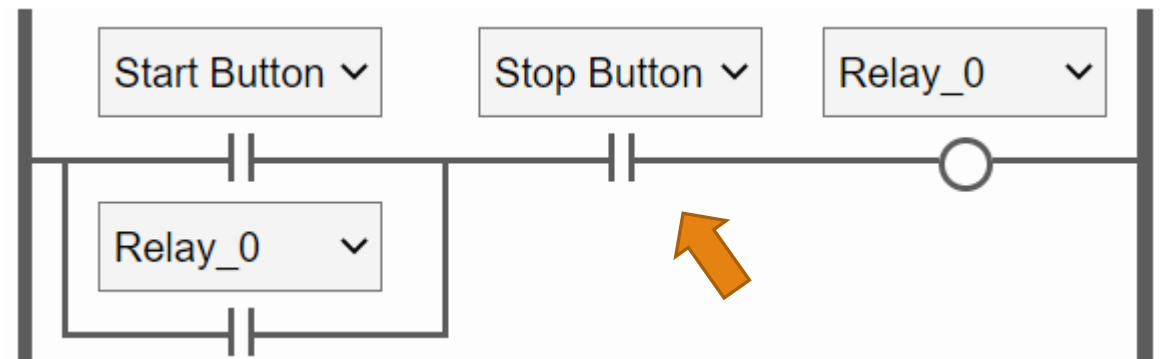a)   b)

Q8C- MCQ

Which PLC ladder program will work properly if a physical **N.C.** stop_button is provided.

a)   b)

Q9 – Design a Ladder logic:

Green LED will turn ON when all 3 conditions are meet:

1. All 3 Pressure Switches (NO) PSW1, PSW2, PSW3 are closed

2. Any 2 out of 3 door Limit Switches (NO) LS1, LS2, LS3 are closed

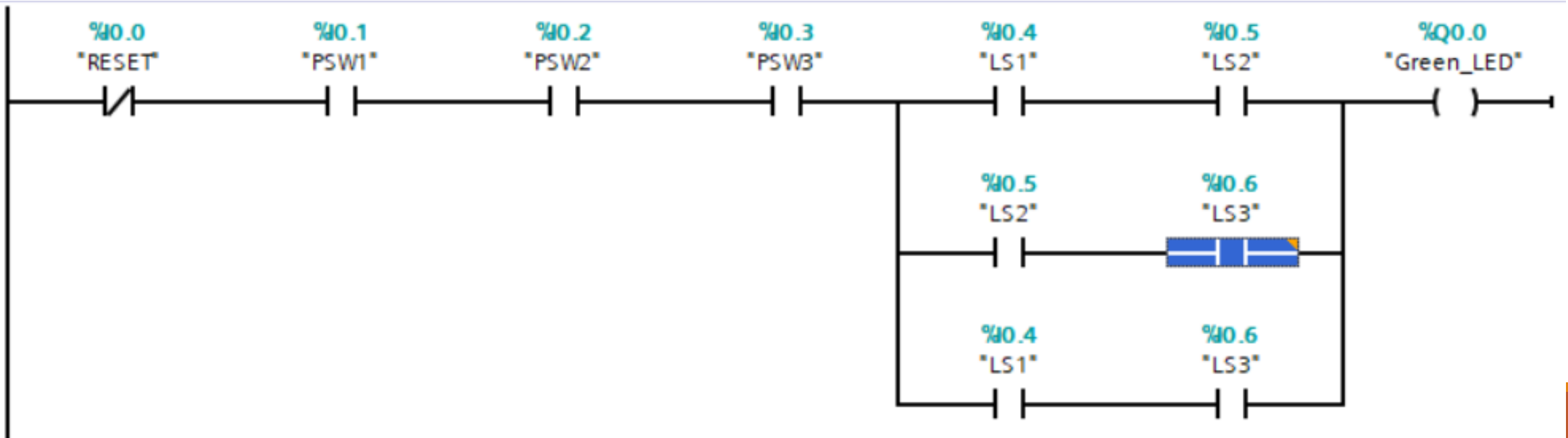3. Reset Switch (NO) is NOT closed.

Q9 – Design a Ladder logic:
Suggested Solution

Green LED will turn ON when all 3 conditions are meet :

All 3 Pressure Switches (NO) PSW1, PSW2, PSW3 are closed

Any 2 out of 3 door Limit Switches (NO) LS1, LS2, LS3 are closed
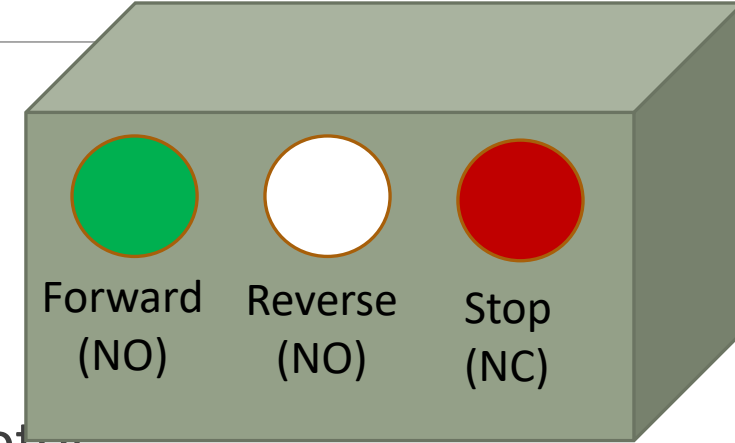
Reset Switch (NO) is NOT closed.

Attempt the following questions

If you need help, Q11 and Q12 has video explanation for deriving the solution.

Q10 – bi-directionaL motor control

Tag Name	Data Type	Address	Comments
Forward	Bool	%I0.0	NO
Reverse	Bool	%I0.1	NO
Stop	Bool	%I0.2	NC
Motor_Fwd	Bool	%Q0.0	
Motor_Rev	Bool	%Q0.1	

You are given

Design a PLC Ladder logic:

Pressing Forward(NO)/Reverse(NO)/Stop(NC) button moves the motor accordingly.

While motor is rotating forward, pressing Reverse button has no effect and vice versa. The motor need to stop before changing direction.
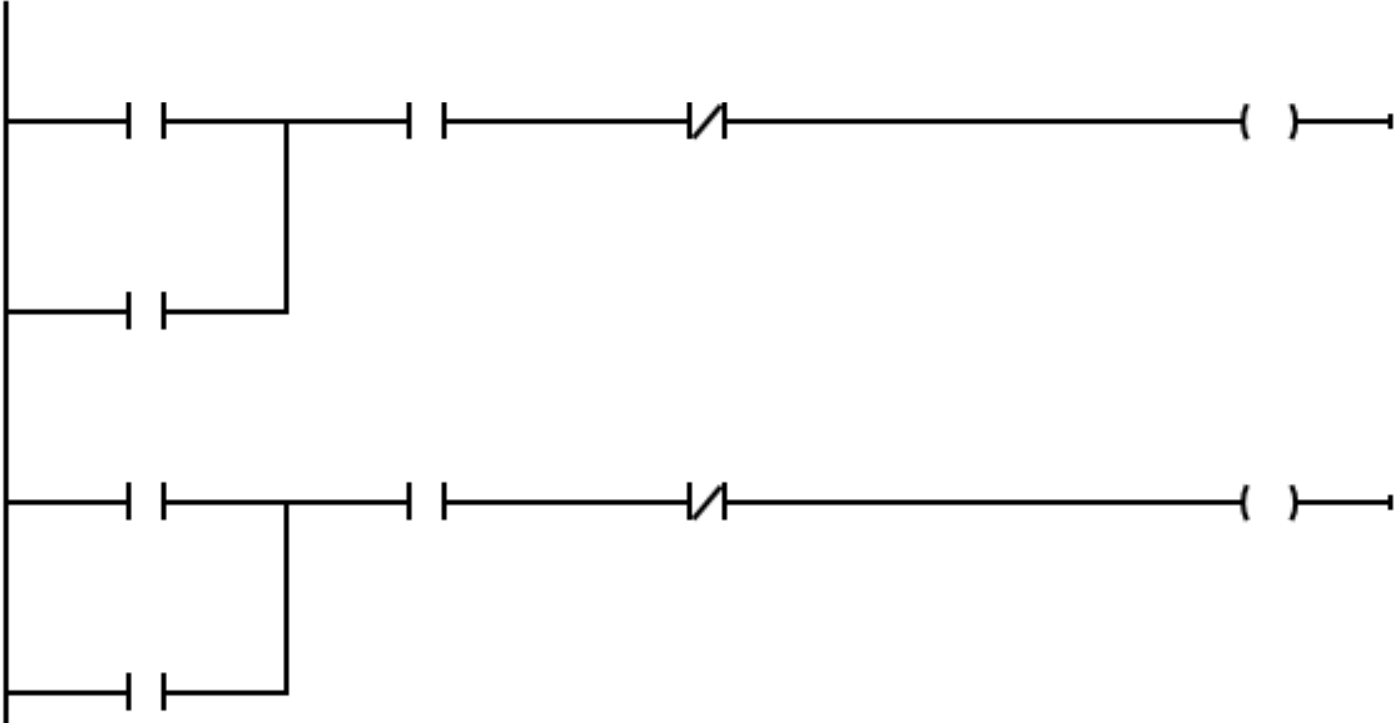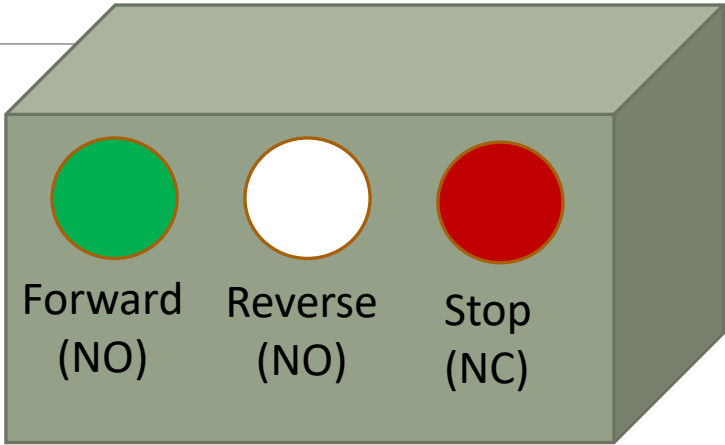
Forward (NO)   Reverse (NO)   Stop (NC)

Q10 – Bi-directional motor control
Complete the ladder

Tag Name	Data Type	Address	Comments
Forward	Bool	%I0.0	NO
Reverse	Bool	%I0.1	NO
Stop	Bool	%I0.2	**NC**
Motor_Fwd	Bool	%Q0.0	
Motor_Rev	Bool	%Q0.1	

Forward (NO)   Reverse (NO)   Stop (NC)

Motor

Q10 – bi-directional motor control
Suggested solution

Tag Name	Data Type	Address	Comments
Forward	Bool	%I0.0	NO
Reverse	Bool	%I0.1	NO
Stop	Bool	%I0.2	**NC**
Motor_Fwd	Bool	%Q0.0	
Motor_Rev	Bool	%Q0.1	

Forward (NO)   Reverse (NO)   Stop (NC)

```
  %I0.0         %I0.2         %Q0.1                           %Q0.0
 "Forward"      "Stop"      "Motor_Rev"                     "Motor_Fwd"
───┤ ├───────────┤ ├───────────┤/├─────────────────────────────( )───────
  │
  %Q0.0
 "Motor_Fwd"
───┤ ├───


  %I0.1         %I0.2         %Q0.0                           %Q0.1
 "Reverse"      "Stop"      "Motor_Fwd"                     "Motor_Rev"
───┤ ├───────────┤ ├───────────┤/├─────────────────────────────( )───────
  │
  %Q0.1
 "Motor_Rev"
───┤ ├───
```
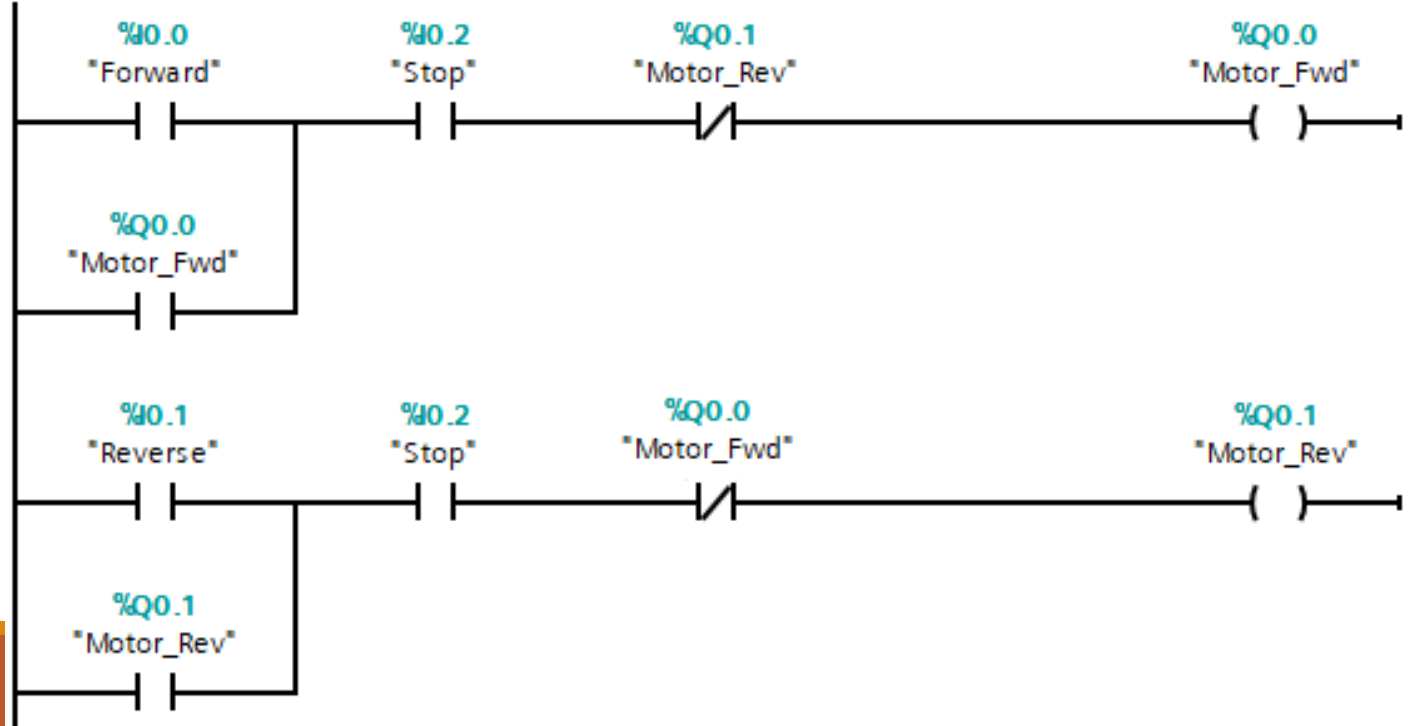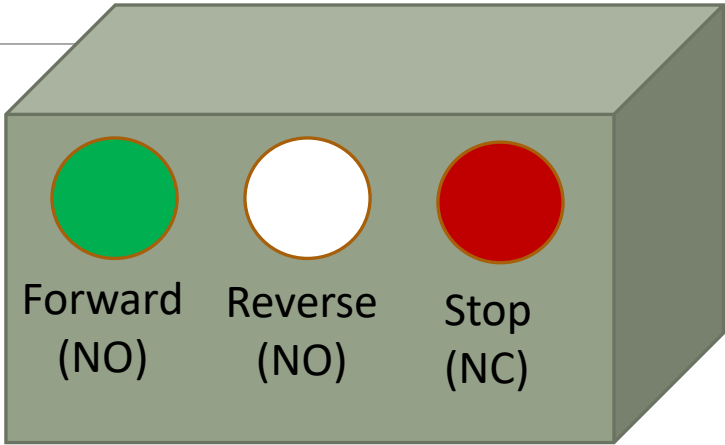
Motor

Q11 – Pump Control

Design a PLC Ladder logic:

Pump will run when Start button pressed and no Fault

Pump will stop when Stop button is pressed or Fault exist

Pressure switch (PSW) at the pump will activate when the pump run
IF pump run for 3 seconds without PSW activated, there is a Fault
and pump shall stop immediately

ACK button acknowledge Fault and turn off Yellow Lamp

Green Lamp indicates Pump is running

Yellow Lamp indicates Fault
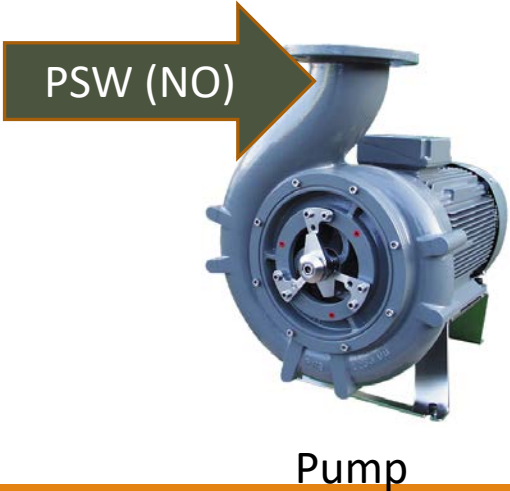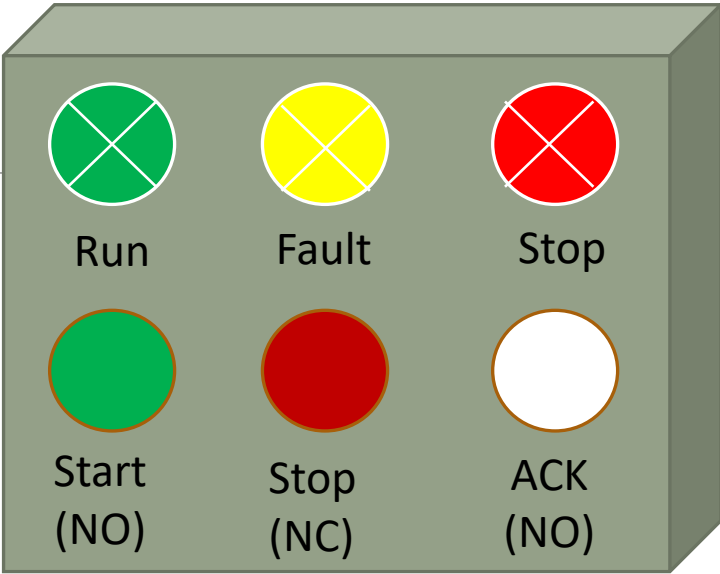
Red Lamp indicates Pump is NOT running

Run   Fault   Stop

Start   Stop   ACK
(NO)   (NC)   (NO)

PSW (NO)
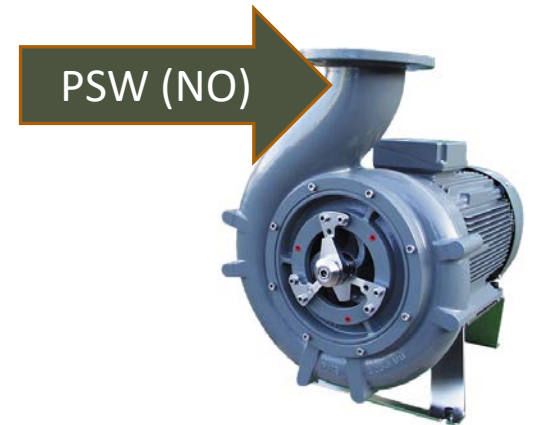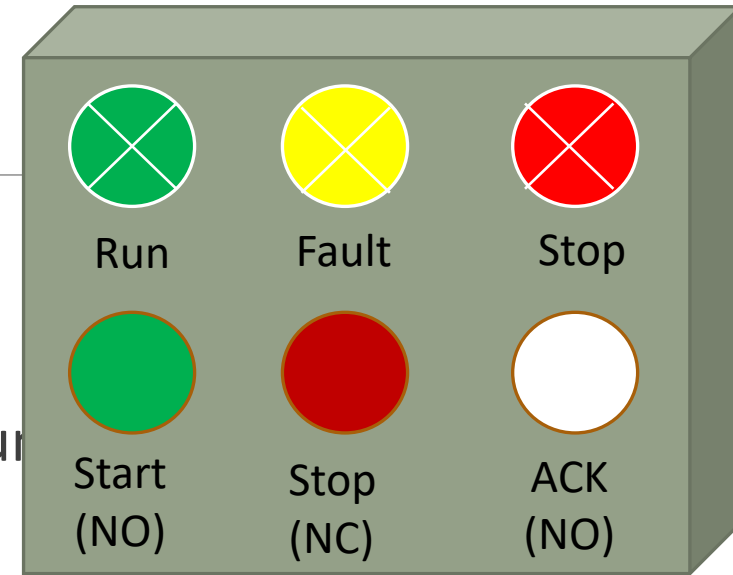
Pump

Q11 – Pump Control
Suggested Solution

Tag Name	Data Type	Address	Comments
Start_PB	Bool	%I0.0	NO
Stop_PB	Bool	%I0.1	NC
ACK_PB	Bool	%I0.2	NO
PSW	Bool	%I0.3	NO
Pump	Bool	%Q0.0	
GreenLamp	Bool	%Q0.1	
YellowLamp	Bool	%Q0.2	
RedLamp	Bool	%Q0.3	

Run   Fault   Stop

Start (NO)   Stop (NC)   ACK (NO)

PSW (NO)
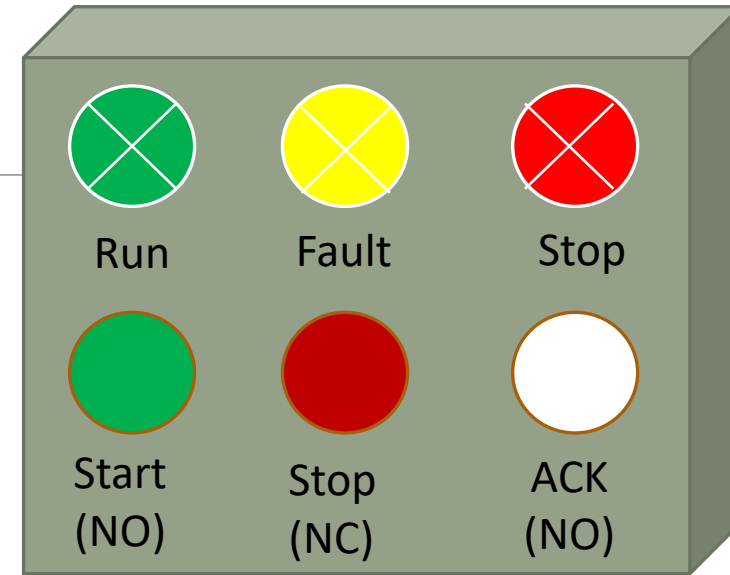
Pump

Q11 – Pump Control
Suggested Solution
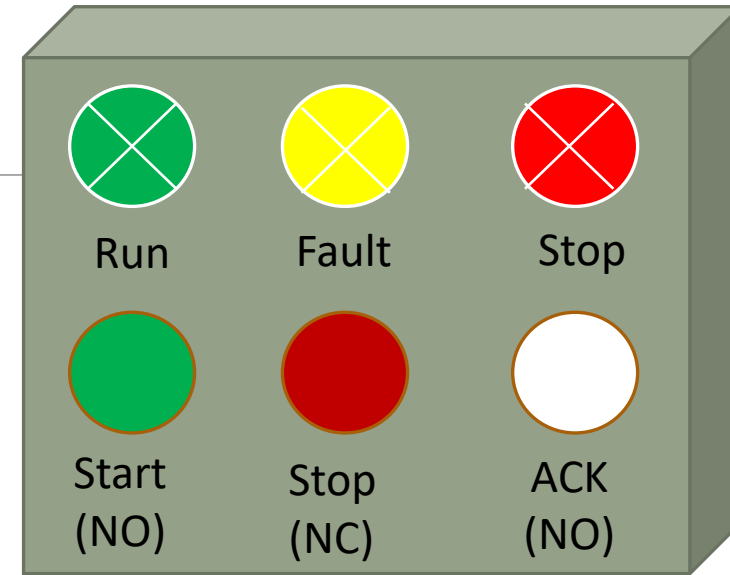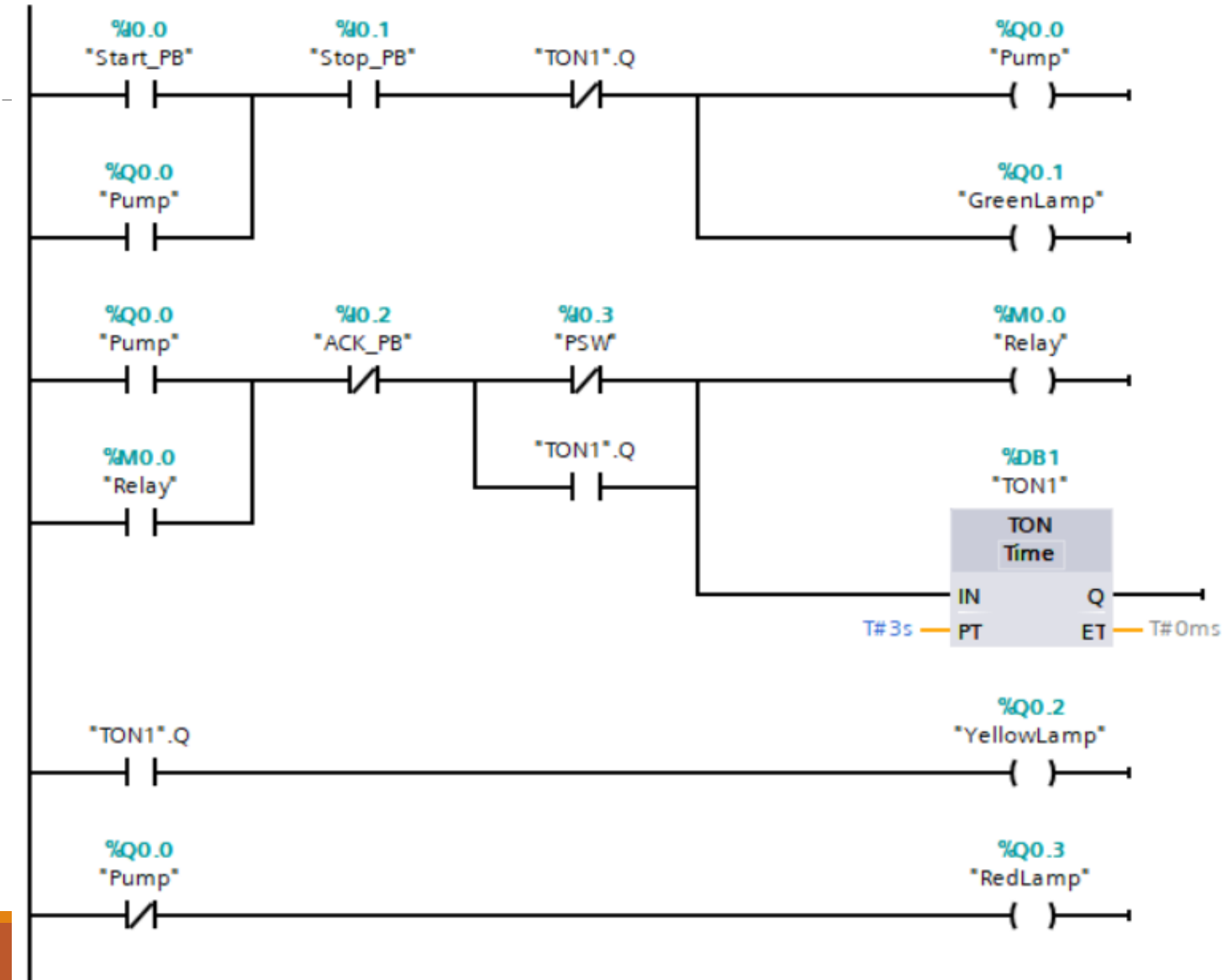
Q12 – Pump Control

Design a Ladder logic:

Modify Q11 to make the Fault Yellow Lamp Blink
  ◦ (Turn ON for 1s Turn OFF for 1s)

Run   Fault   Stop

Start   Stop   ACK
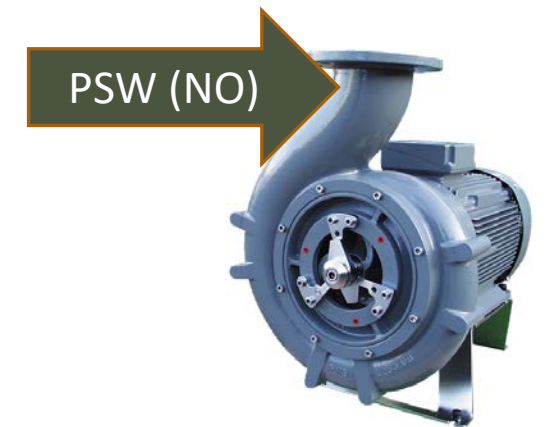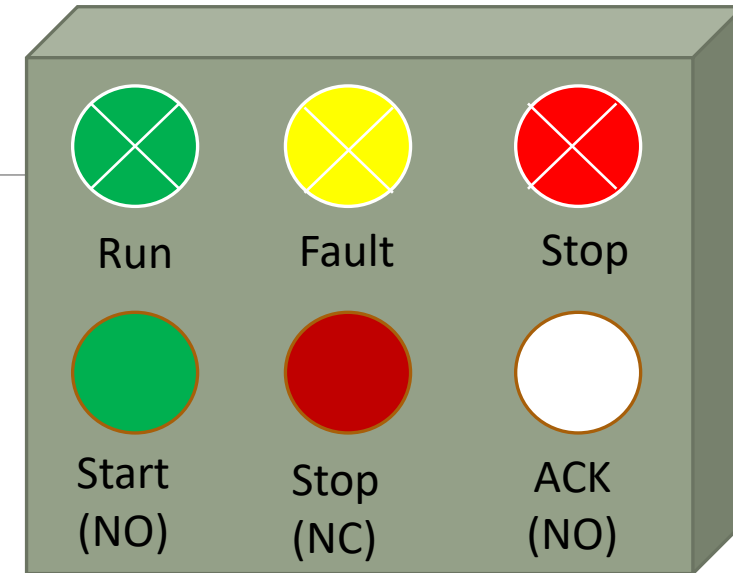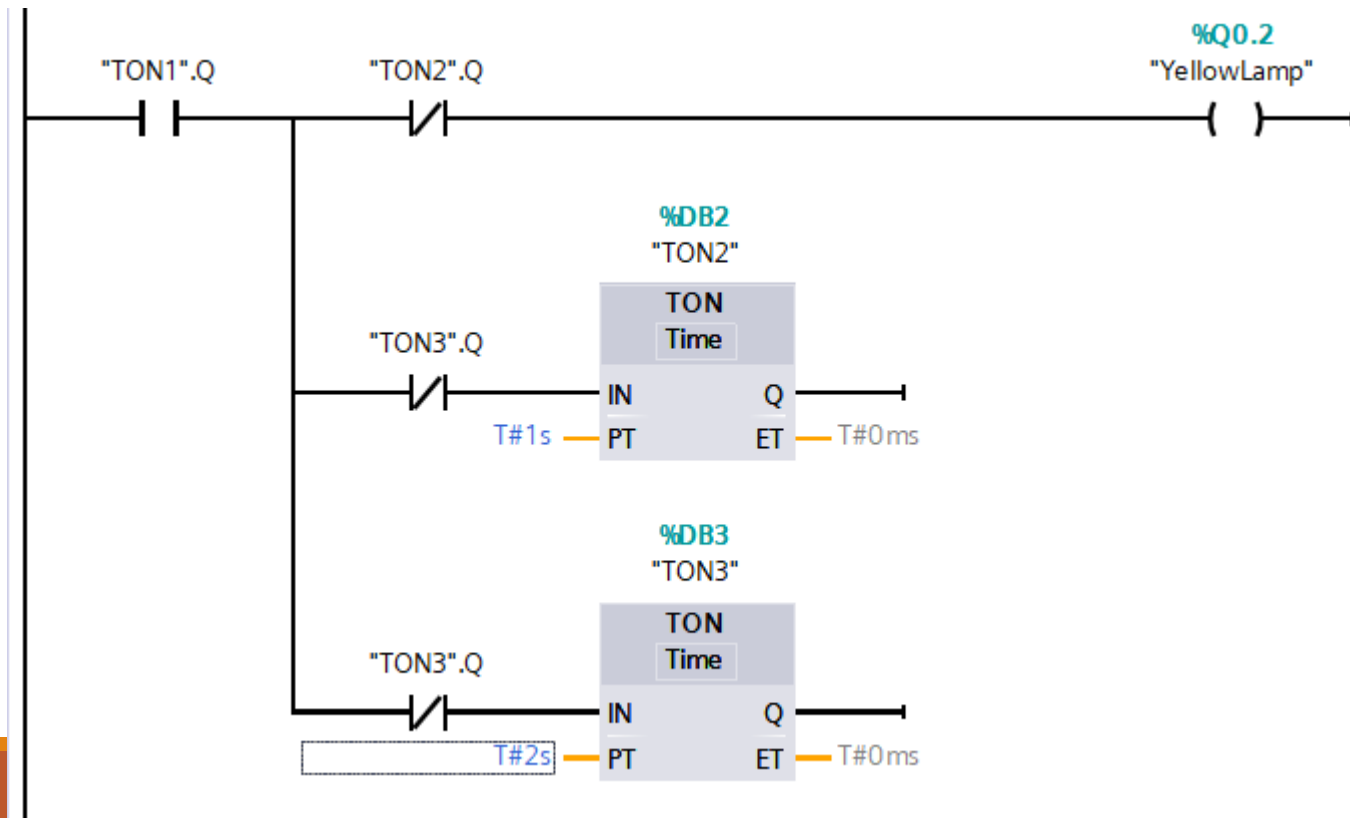(NO)   (NC)   (NO)

PSW (NO)

Pump

Q12 –Pump Control
Suggested Solution

<u>Design a Ladder logic:</u>

Modify Q11 to make the Fault Yellow Lamp Blink
- ◦ (Turn ON for 1s Turn OFF for 1s)

Run   Fault   Stop

Start (NO)   Stop (NC)   ACK (NO)

PSW (NO)

Pump