Task 5

Exercise 1 (3p):

The circuit shown in Figure 1 a relay circuit that uses Relay Coils to control a Lamp.

Q1: Determine the equivalent relay Ladder logic circuit

Q2: Determine the equivalent PLC Ladder logic circuit

Q3: Implement the circuit using TIA and test it with PLCSIM
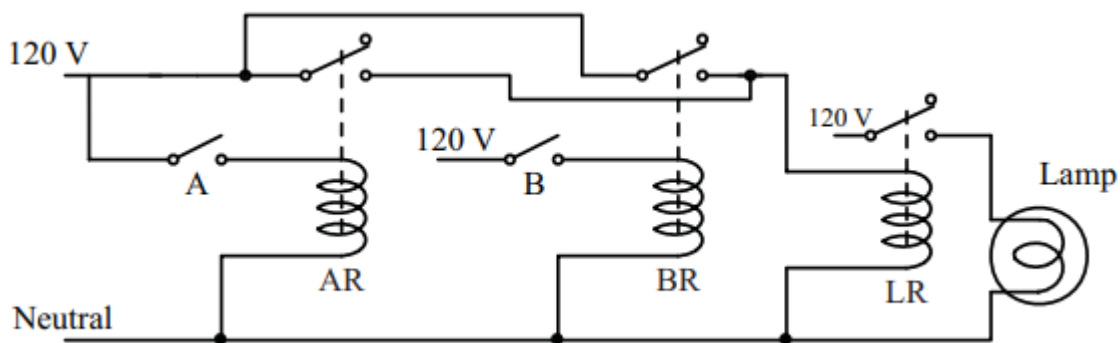

Figure 1

Exercise 2 (3p):

Suppose a lamp needs to be turned ON when a switch A is ON (Closed) and switch B is OFF (Open).

Q1. Implement this function as relay Ladder logic circuit

Q1. Implement this function as a PLC ladder logic where the two switches are separate.
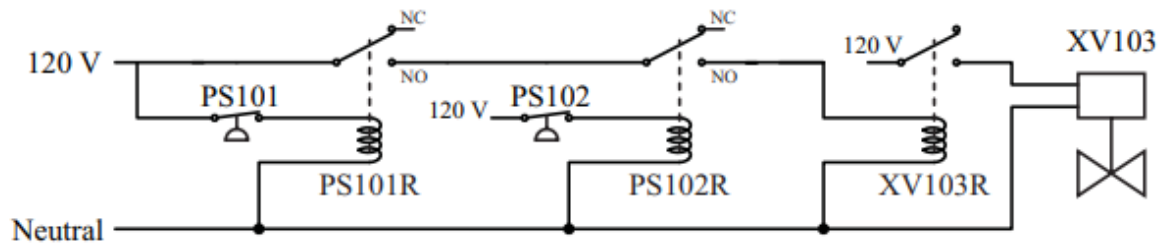
Q2. Use TIA and PLCSIM to test your solution

Exercise 3 (3p)

The circuit shown in Figure 2 a relay circuit that uses Relay Coils to control a Valve.

Q1: Determine the equivalent relay Ladder logic circuit

Q2: Determine the equivalent PLC Ladder logic circuit

**Q3**: Implement the circuit using TIA and test it with PLCSIM

Figure 2:

Exercise 4 (4 points)

Q1. Use PLCSIM to test the logic operators (AND, OR, EXOR and XNOR)

Q2. Use PLCSIM to test the Latch operation (RS, SR)

Q3. Use PLCSIM to test the delay operation

Q4. Use PLCSIM to test the Timer operation

Exercise 5 (2 p)

Q1. Draw a PLC ladder diagram that is equivalent to the digital logic diagram in Figure 3

Q2. Simulate the Digital Function of figure 3 using PLCSIM
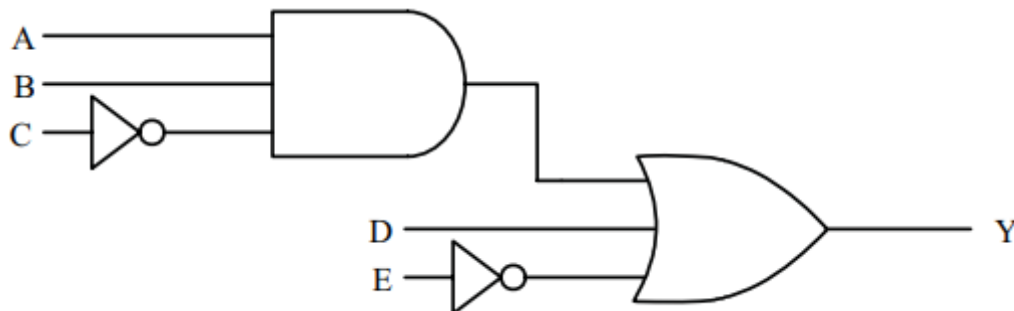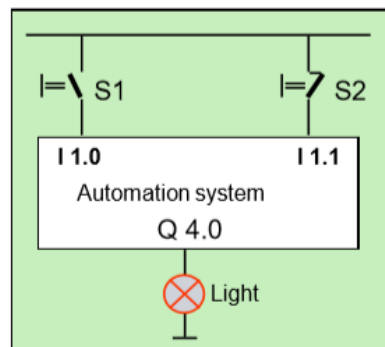

Figure 3

Exercise 6 (3 points)

In the following Hardware configuration, it is desired that the light should be ON when S1 is activated and S2 is Not activated

Note: In the following example you should use either "NO contact" or "NC contact" depending on the case

Q1: Write a PLC program using LAD, FDB and STL to implement the following Hardware, then use TIA and PLCSIM to test it.:
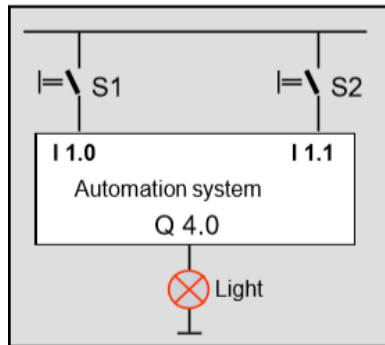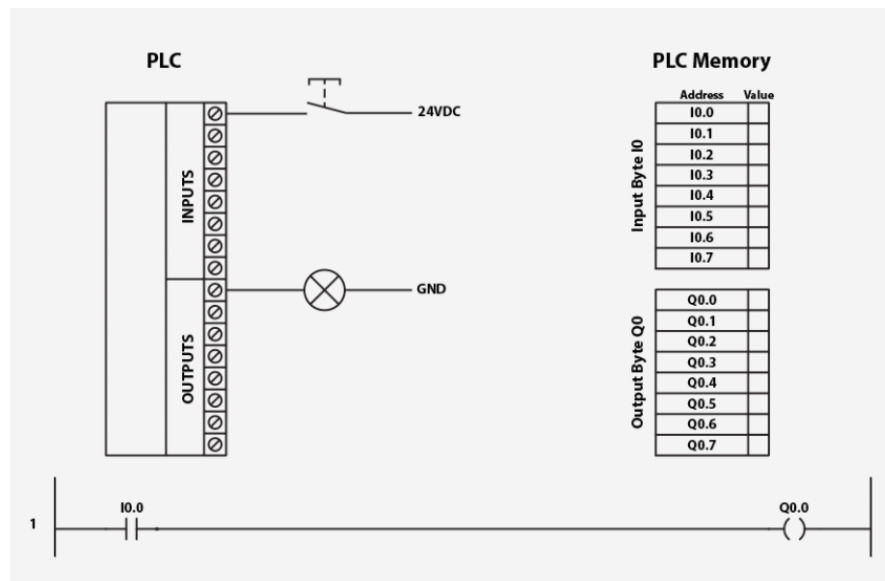
Q2: Write a PLC program using LAD, FBD and STL to implement the following Hardware, then use TIA and PLCSIM to test it.:

Q3: Write a PLC program using LAD, FBG and STL to implement the following Hardware, then use TIA and PLCSIM to test it.:
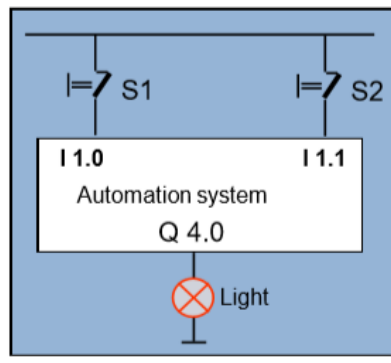
Exercise 7 (8 Points)

Figure 4

In the LAD logic of the figure 4, the Light will be on when the pushbutton is pressed. As you can notice, the light is ON as long as the operator hold his finger on the pushbutton. But how to change the LAD logic to keep the light ON even though the operator releases the pushbutton.

Q1. In LAD logic they are two ways to do that. Implement these two ways   using the TIA portal and test your solution with PLCSIM. (3 p)

Q2. You will notice that after you test your solution the light will remain on after the operator release the pushbutton. But we need to switch off the light some time. How to change the program to enable the operator to stop the light (5 p)

Exercise 8 (10p)

Consider the following simple Motor starters control circuit:
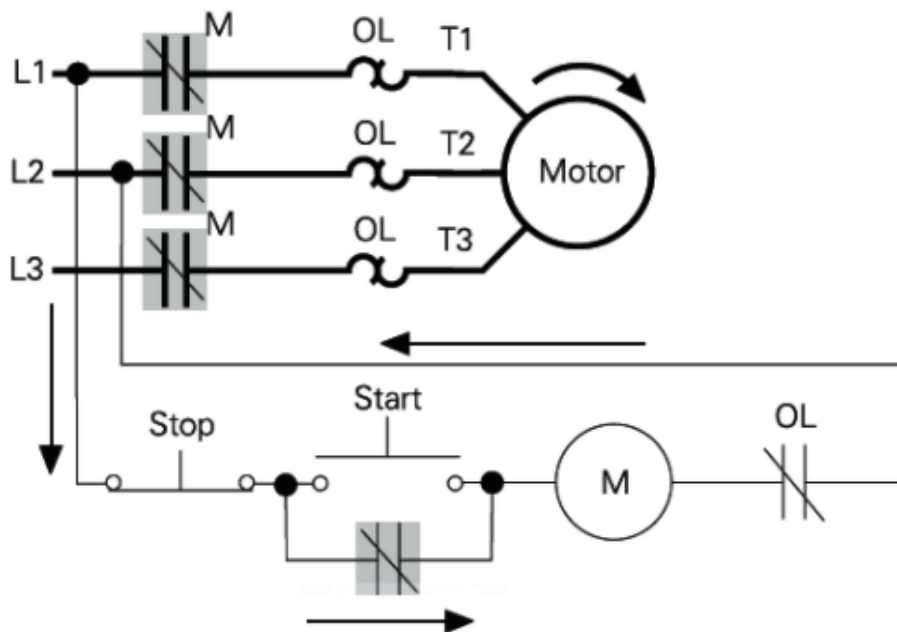
The motor starter control circuit has the following characteristics:

- Push button to start the motor : The motor should continue to rotate even when the push button is released.
- Stop Push button to halt the motor after it started.
- Over current protection : In case of over load, the motor should stop automatically by the signal coming from contactors of overload relay.
- Limit switch : It should prevent the motor from starting and can also stop the running motor.
- The motor starter should also have indicator (Lights) to show ON or OFF status of motor.

Q1. Implement the motor starter control circuit using PLC Ladder diagram

Q2: Use TIA and PLCSIM to test and simulate the operation of the motor