Course Code: RME 2202
Course Name: Microcontroller and Programmable Logic Controller Lab

Experiment No: 05
Experiment Name: Controlling the direction of rotation of DC motor with counter using PLC.

Prepared By: Rabeya Akter
Roll no: SK-092-015
2nd year 2nd semester
Department of Robotics and Mechatronics Engineering,
University of Dhaka

Submitted to: Dr. Shamim Ahmed Deowan
Chairman,
Department of Robotics & Mechatronics Engineering,
University of Dhaka

Date of submission: 15 February 2021

Objective:

- To learn the basic principle of the PLC
- To learn the applications of the PLC
- To get introduced with the PLC programming using LOGO! Soft Comfort V8.2

Theory:

A programmable logic controller (PLC) or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process fault diagnosis. They were first developed in the automobile manufacturing industry to provide flexible, ruggedized and easily programmable controllers to replace hard-wired relays, timers and sequencers. The most basic function of a programmable controller is to emulate the functions of electro-mechanical relays. Discrete inputs are given a unique address, and a PLC instruction can test if the input state is on or off. Just as a series of relay contacts perform a logical AND function and a parallel set of instructions will perform a logical OR, not allowing current to pass unless all the contacts are closed.

IEC 61131-3 standard currently defines five programming languages for programmable control systems: function block diagram (FBD), ladder diagram (LD), structured text (ST; similar to the Pascal programming language), instruction list (IL; similar to assembly language), and sequential function chart (SFC). These techniques emphasize logical organization of operations. The most commonly used programming language is Ladder diagram (LD) also known as Ladder). It uses Contact-Coil logic to make programs like an electrical control diagram.

The main difference from most other computing devices is that PLCs are intended-for and therefore tolerant-of more severe conditions (such as dust, moisture, heat, cold), while offering extensive input/output (I/O) to connect the PLC to sensors and actuators. PLC input can include simple digital elements such as limit switches, analog variables from process sensors (such as temperature and pressure), and more complex data such as that from positioning or machine vision systems.

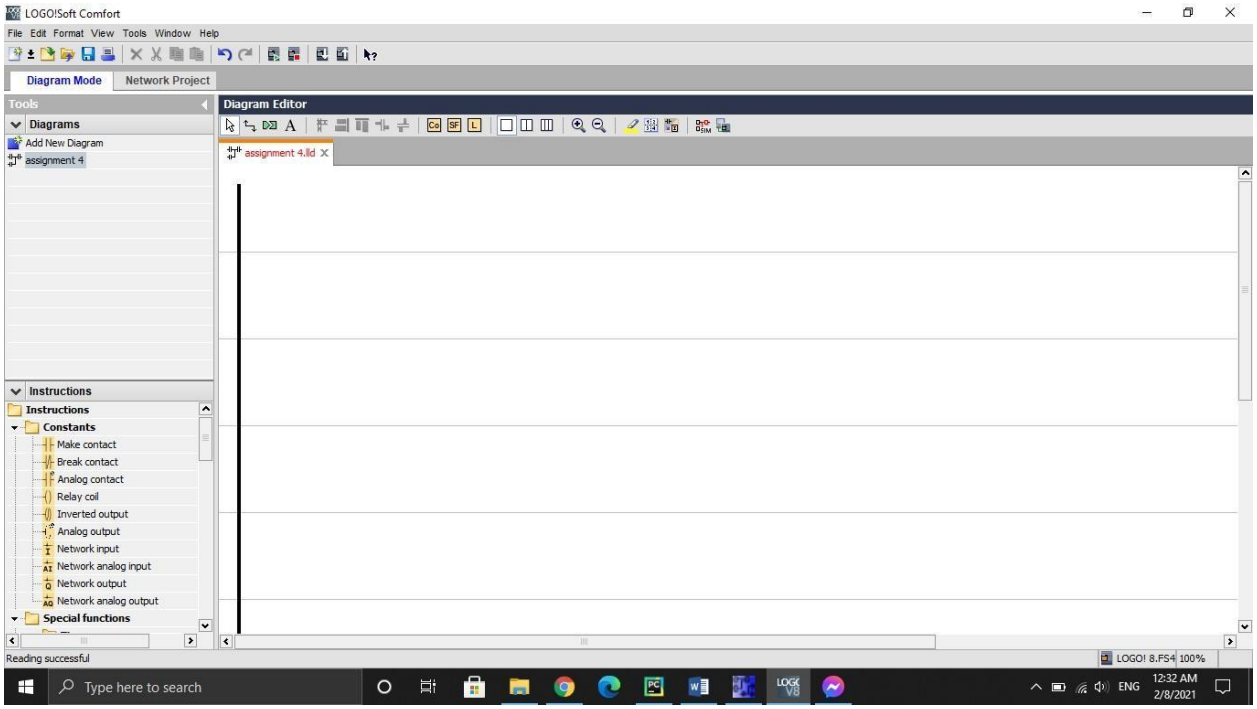
In PLC discrete (digital) signals behave as binary switches, yielding simply an On or Off signal (1 or 0, True or False, respectively). Push buttons, limit switches, and photoelectric sensors are examples of devices providing a discrete signal. Discrete signals are sent using either voltage or current, where a specific range is designated as On and another as Off. For example, the PLC used in the experiment use 24 V DC I/O, with values above 22 V DC representing On, values below 22V DC representing Off, and intermediate values undefined. Initially, PLCs had only digital I/O.

Equipment:

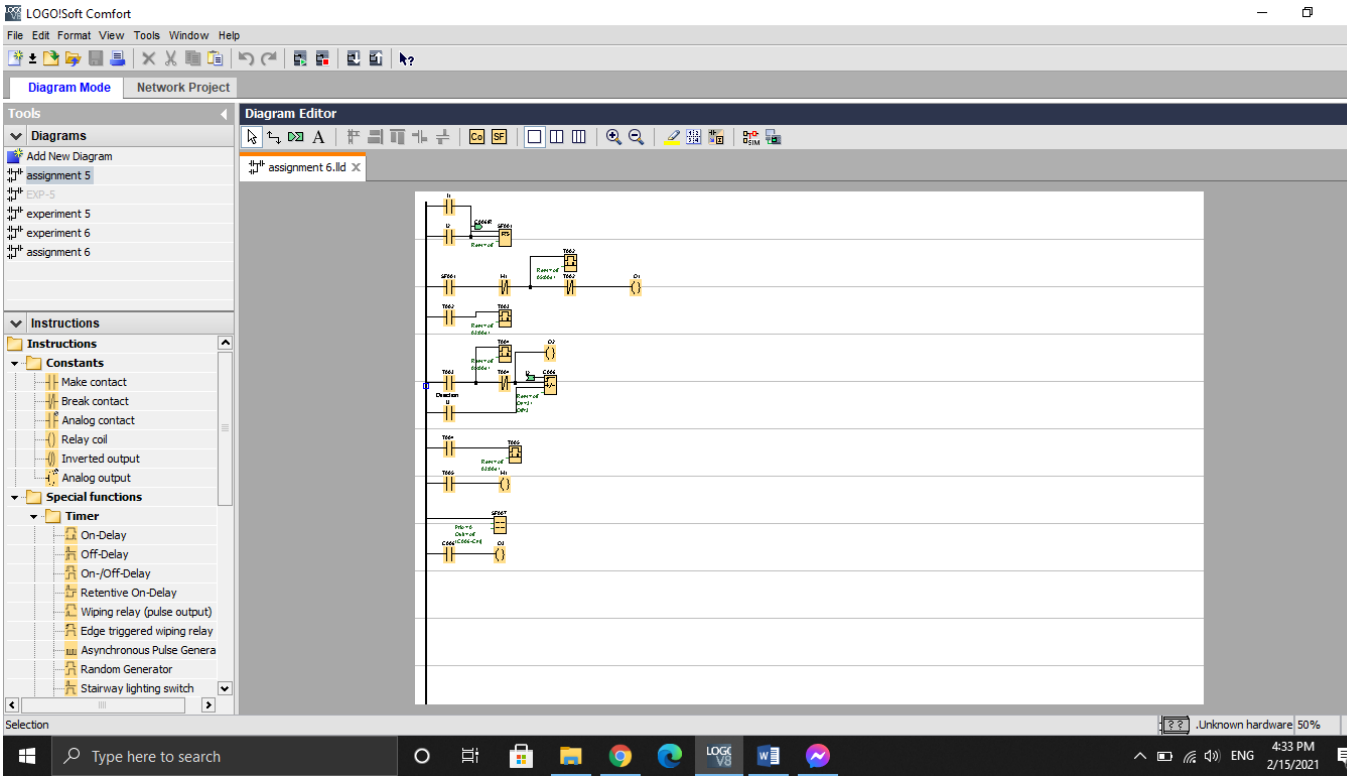
- Computer
- LOGO! Soft Comfort V8.2

Procedure:

- At first I opened the LOGO! Soft Comfort V8.2 software.
- Then I opened new file in ladder diagram format naming it ‘assignment 6.lld’



- Then I took all the input contacts and outputs (relay coil) and connected them as the given circuit and completed the ladder diagram.

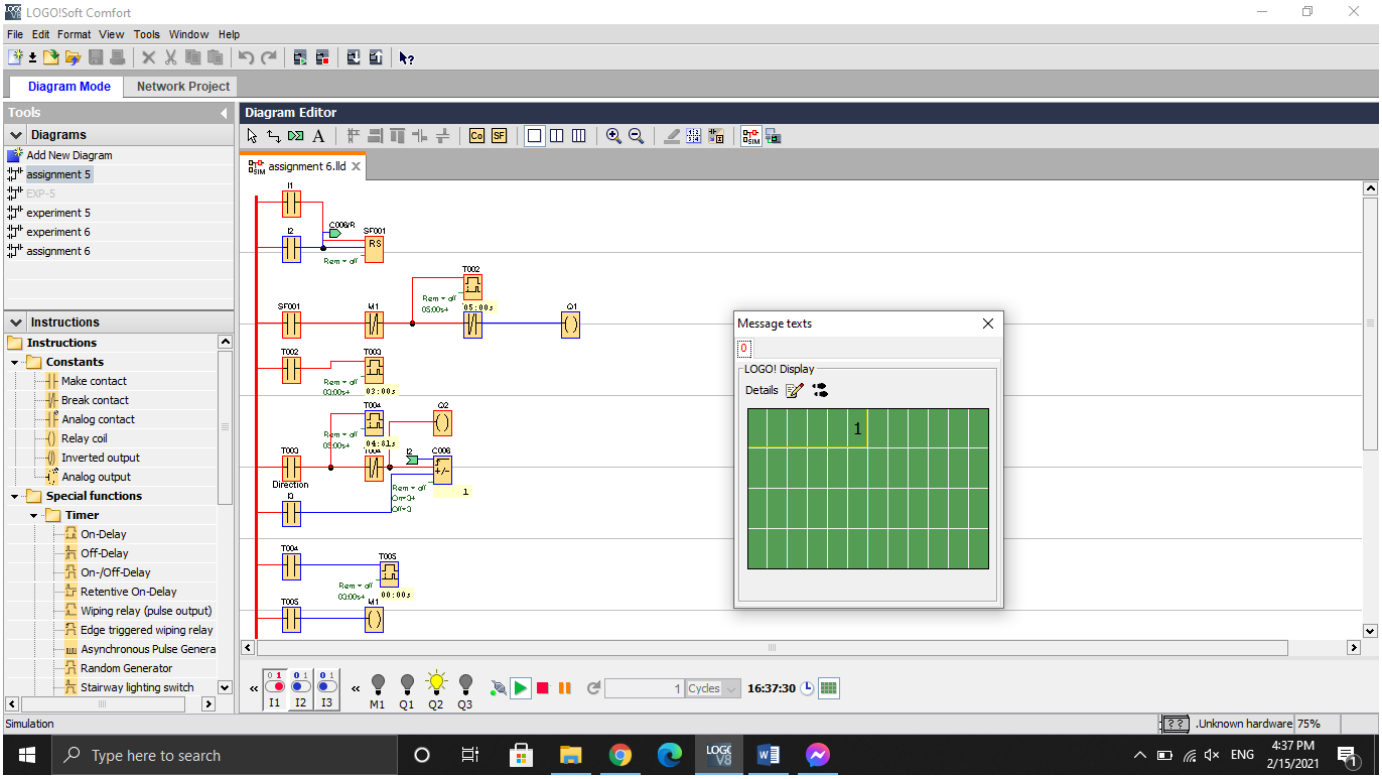


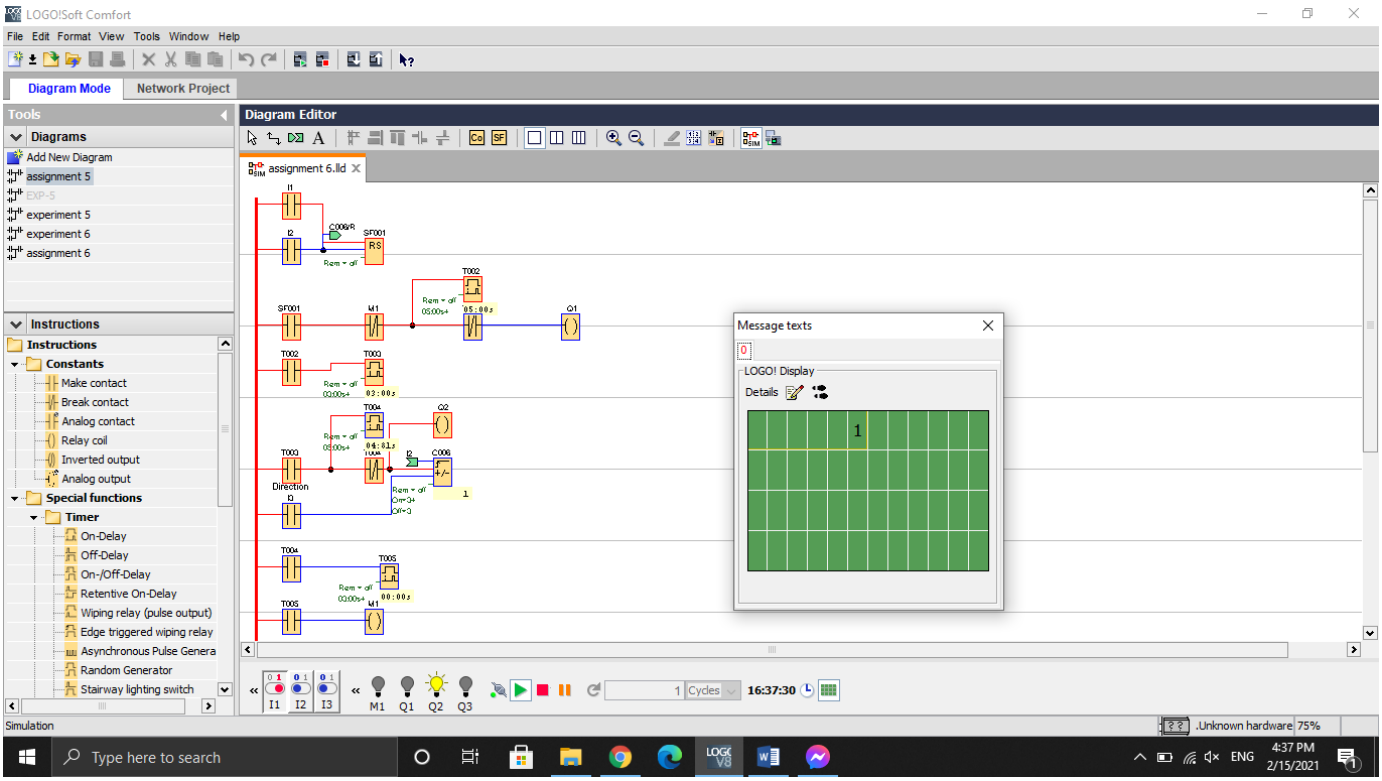
- Finally I simulated the ladder.

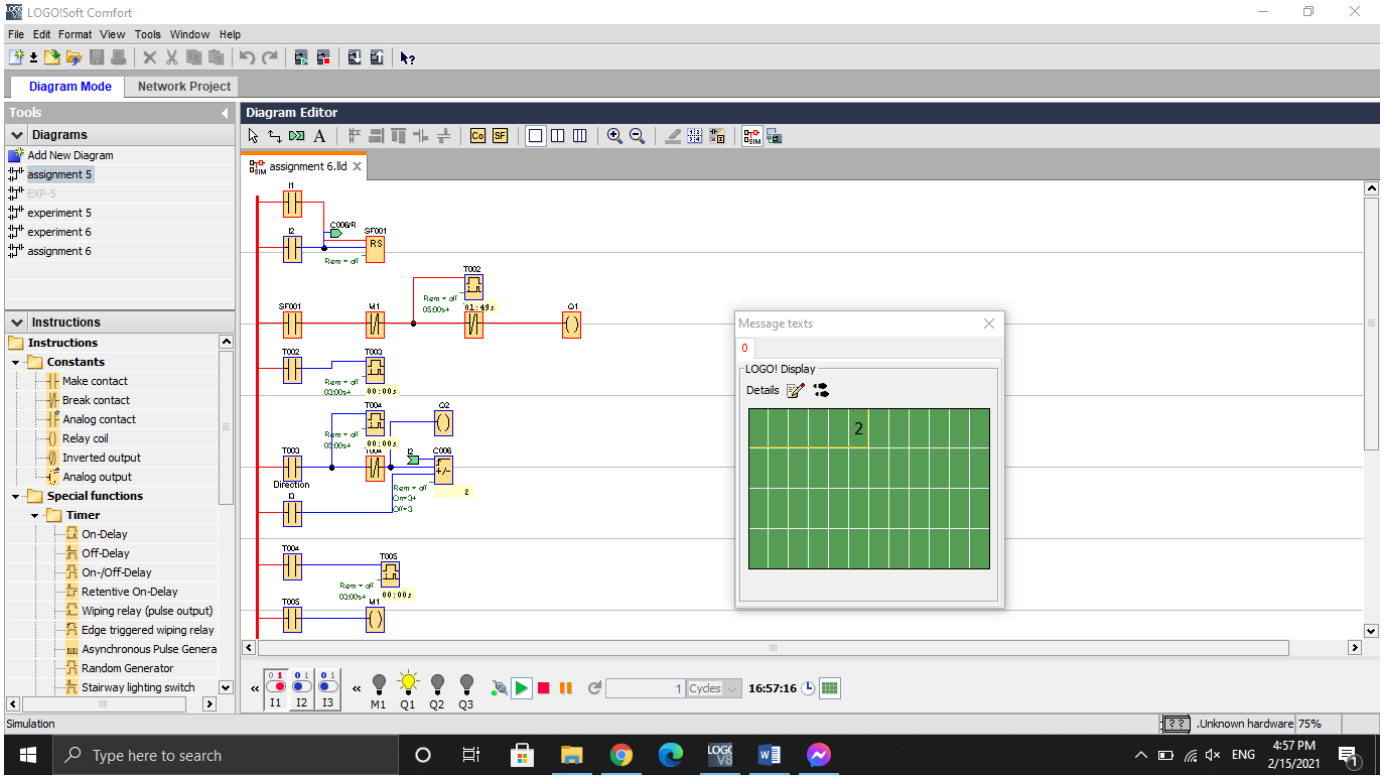
Result:

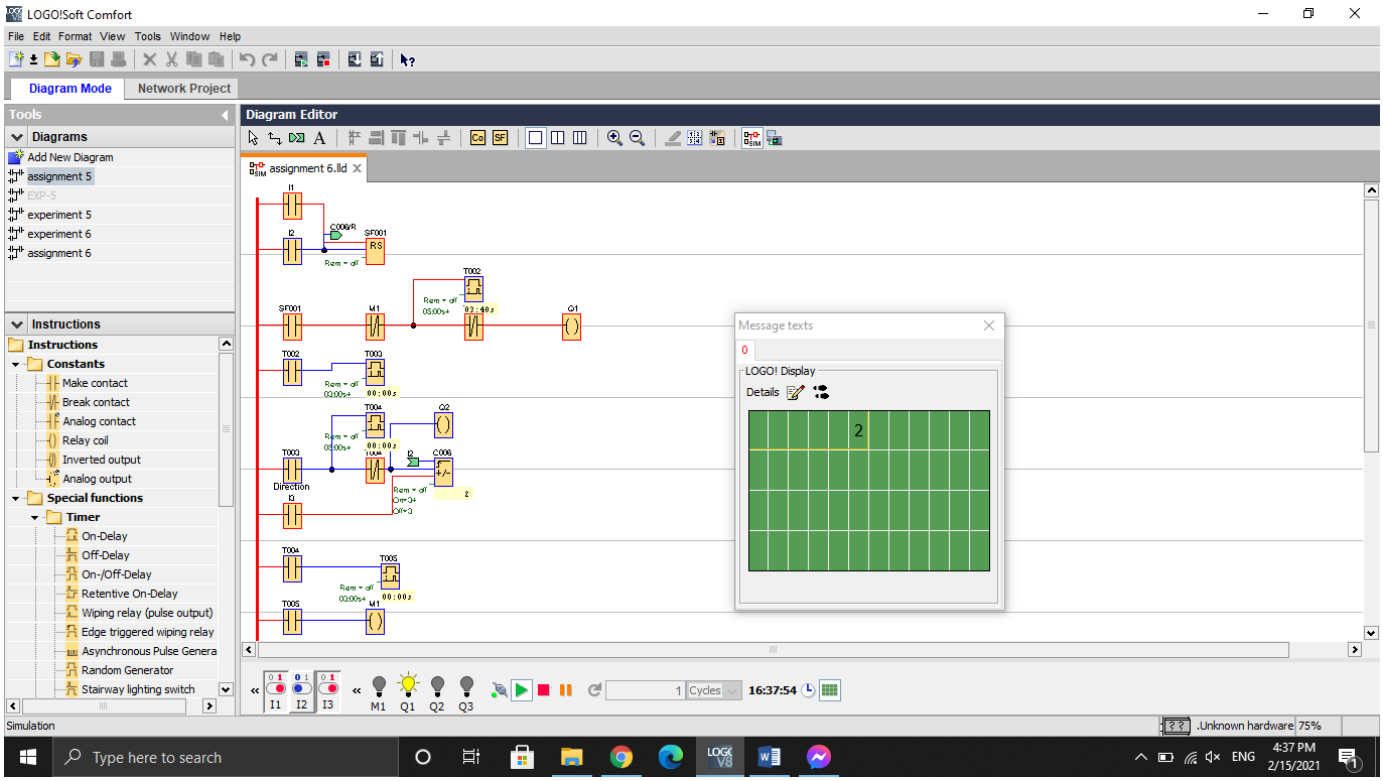
During the simulation when I1 was on and I3 was off, first the motor Q1 rotates for 5 sec, then for 5 sec none of the motor rotates, then for 5 sec motor Q2 rotates, then again a 3 sec break happens and counter's count increase by 1. And this keeps repeating.

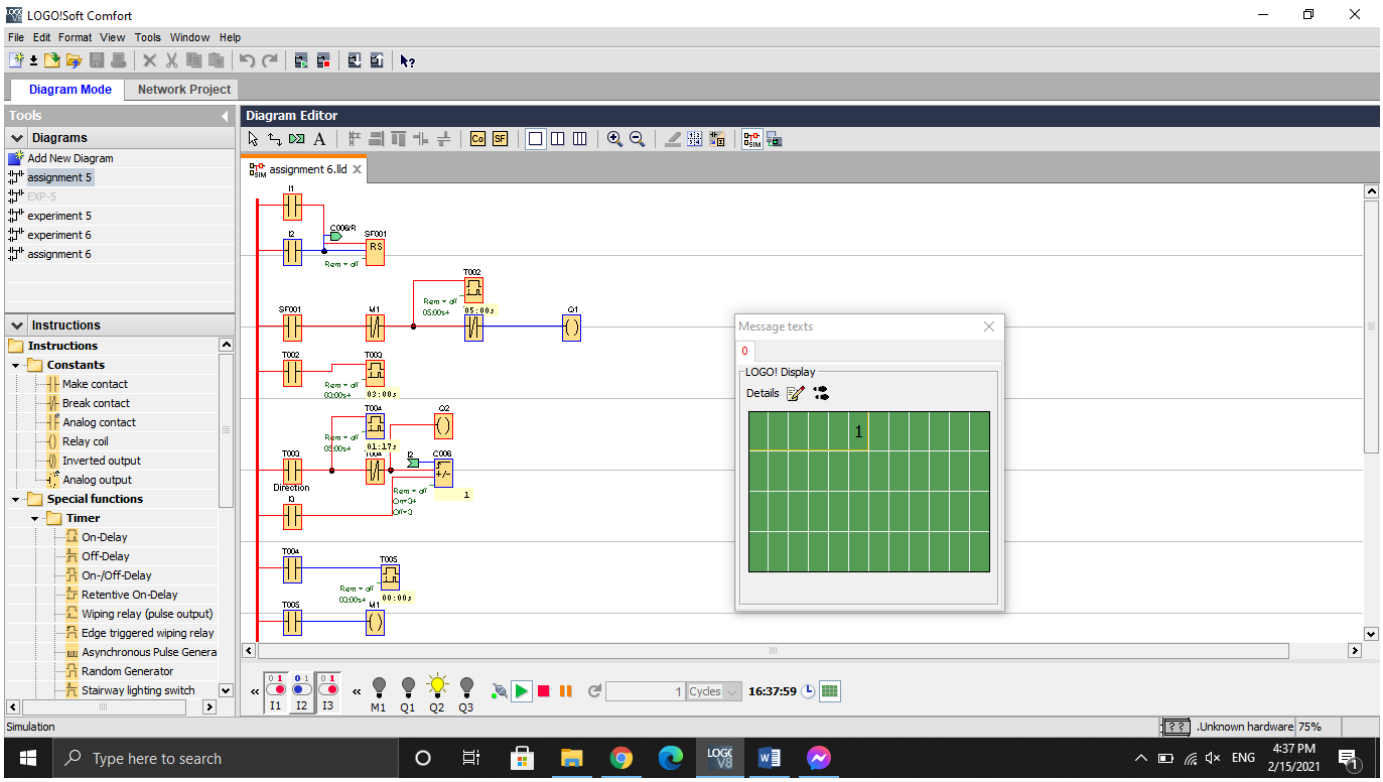
After that when I1, I3 was on, first the motor Q1 rotates for 5 sec, then for 5 sec none of the motor rotates, then for 5 sec motor Q2 rotates, then again a 3 sec break happens and counter's count decrease by 1.


LOGO!Soft Comfort
File Edit Format View Tools Window Help
Diagram Mode
Network Project
Tools
Diagrams
Add New Diagram
assignment 5
EXP-5
experiment 5
experiment 6
assignment 6
Instructions
Constants
Make contact
Break contact
Analog contact
Relay coil
Inverted output
Analog output
Special functions
Timer
On-Delay
Off-Delay
On-/Off-Delay
Retentive On-Delay
Wiping relay (pulse output)
Edge triggered wiping relay
Asynchronous Pulse Genera
Random Generator
Stairway lighting switch
Diagram Editor
assignment 6.lld
Message texts
LOGO! Display
Details
Cycles
16:37:30
Simulation
Unknown hardware
75%
Type here to search
ENG
4:37 PM
2/15/2021


LOGO!Soft Comfort
File Edit Format View Tools Window Help
Diagram Mode
Network Project
Tools
Diagrams
Add New Diagram
assignment 5
EXP-5
experiment 5
experiment 6
assignment 6
Instructions
Constants
Make contact
Break contact
Analog contact
Relay coil
Inverted output
Analog output
Special functions
Timer
On-Delay
Off-Delay
On-/Off-Delay
Retentive On-Delay
Wiping relay (pulse output)
Edge triggered wiping relay
Asynchronous Pulse Genera
Random Generator
Stairway lighting switch
Diagram Editor
assignment 6.lld
Message texts
LOGO! Display
Details
Cycles
16:37:30
Simulation
Unknown hardware
75%
Type here to search
ENG
4:37 PM
2/15/2021


LOGO!Soft Comfort
File Edit Format View Tools Window Help
Diagram Mode
Network Project
Tools
Diagrams
Add New Diagram
assignment 5
EXP-5
experiment 5
experiment 6
assignment 6
Instructions
Instructions
Constants
Make contact
Break contact
Analog contact
Relay coil
Inverted output
Analog output
Special functions
Timer
On-Delay
Off-Delay
On-/Off-Delay
Retentive On-Delay
Wiping relay (pulse output)
Edge triggered wiping relay
Asynchronous Pulse Genera
Random Generator
Stairway lighting switch
Diagram Editor
assignment 6.lld
Message texts
LOGO! Display
Details
2
I1 I2 I3 M1 Q1 Q2 Q3
16:57:16
Simulation
Unknown hardware 75%
Type here to search
ENG
4:57 PM
2/15/2021


LOGO!Soft Comfort
File Edit Format View Tools Window Help
Diagram Mode
Network Project
Tools
Diagrams
Add New Diagram
assignment 5
EXP-5
experiment 5
experiment 6
assignment 6
Instructions
Instructions
Constants
Make contact
Break contact
Analog contact
Relay coil
Inverted output
Analog output
Special functions
Timer
On-Delay
Off-Delay
On-/Off-Delay
Retentive On-Delay
Wiping relay (pulse output)
Edge triggered wiping relay
Asynchronous Pulse Genera
Random Generator
Stairway lighting switch
Diagram Editor
assignment 6.lld
Message texts
LOGO! Display
Details
2
I1 I2 I3 M1 Q1 Q2 Q3
16:37:54
Simulation
Unknown hardware 75%
Type here to search
ENG
4:37 PM
2/15/2021



However, I got the expected result that is when any two inputs out of the three inputs is turned on then output coils will be turned on, otherwise it won't give any output.

Discussion & conclusion:

PLC can be used to control different peripheral devices. We simulated the ladder circuit and we saw the output matches with the implemented logic. So we can consider the experiment successful.