Mahavir Education Trust's

Shah & Anchor Kutchhi Engineering College

Chembur, Mumbai 400 088

(An Autonomous Institute Affiliated to University of Mumbai)

EXPERIMENT NO: 2				
Date of Performance:				
Date of Submission:				
Program Execution/ formation/ correction/ ethical practices (06)	Timely Submission (01)	Viva (03)	Experiment Total (10)	Sign with Date

2.1. Aim: To understand the Simple Ladder program.

2.2. Course Outcome: Explain the major technologies, languages, applications, social, economic and ethical consequences of a robotic manipulator.

2.3. Learning Objectives:. To Solve the problem using ladder programming.

2.4. Requirement:. Portal link: https://plc-coep.vlabs.ac.in/exp/implementation-logicgates/

2.5. Related Theory:

Each manufacturer of PLC systems has own style of writing the instructions. Different PLCs has different instruction sets but even some common basic instructions are shared by all the PLCs. All manufacturers give different software packages for programming PLCs. Ladder is most commonly used programming language. Prior to PLCs, relay logic was used in industry. Ladders were developed to mimic or imitate relay logic.

Relay Logic / Instructions A relay is simple magnetic device which acts as a control switch. When the switch is on, current will flow through the coil on iron piece. This iron core acts a electromagnet and due to the magnetic field upper contact gets attracted towards lower one and circuit gets completed, allowing current to flow from load.

Ladder Programming

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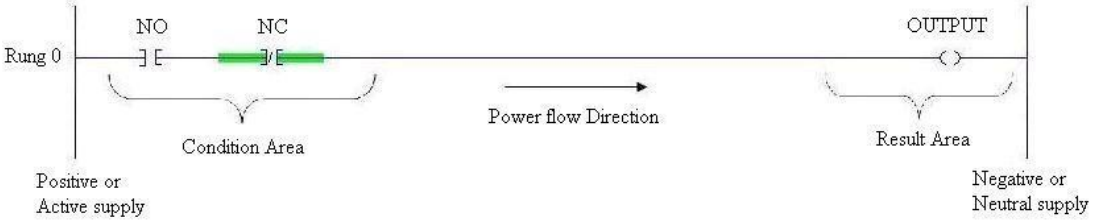
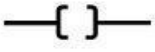
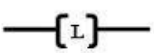
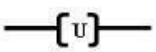
Ladder diagram is popular language of programming the PLCs. Ladder diagram shows the sequence of the logic execution which is presented diagrammatically. In ladder diagram, There are two vertical lines generally called as Phase (positive) or neutral. Rungs which show current flow in horizontal direction are the sequence in which the logic executes. The Analogous to relay, ladder has two main symbols which are contacts and output coil. Generally each rung has inputs (contacts) on left hand side and outputs (coil) on the right hand side. These contacts and coils are called as bits of the relays. Each input and output are individual bit in I/O files. An instruction in ladder instructs PLCs how to respond to the bits in I/O files which are stored in the memory. Input contacts are the condition area, the conditions must be fulfilled to change the status of the output coils.



Typical Ladder Diagram

Most commonly used relay instructions used in PLC programming are as shown in the table:

Instruction	Symbol	Description
Examine ON (Normally Open)		An input condition that is open when de-energized
Examine OFF (Normally Closed)		An input condition that is close when de-energized
Output coil		An output instruction that is true when the input conditions become true
Negated Output		An output instruction that is true all the time except when all input conditions true
Latch Output Coil		To hold an output ON
Unlatch		To unlatch the latched ON output

2.6. Procedure:

Important steps for developing Ladder using Simulator:

Please follow the steps so as to understand the procedure for developing ladder logic for various logical gates.

1. Prior to starting of the development of ladder diagram following steps needs to be understood:

   - Understand the problem statement like test the logic for OR gate, AND Gate etc.
   - Develop the logic on paper and validate the logic by considering various cases
   - Prepare the truth table and test the logic using all valid cases
   - Go to simulator icon and click on the "Simulator" button ● The PLC simulator will be opened in new window.

2. The procedure for writing the ladder diagram in the work space is as follows:

   Add a new rung by clicking on the 'Add Rung' icon. The window will appear like this:

   Place the contacts as per the requirement by left clicking the appropriate contact shown at the top side. In the example demonstrated below one normally contact and one coil is placed as shown the figure.

   Right click on the contact or coil and you can give tag name like "start", "stop" etc. Please ensure that the tag numbers are true replica of process connections. Similarly give tag name to coil like "motor", "Lamp" etc. The final ladder will look like this.

   Please note that the tag names are case sensitive and if you are using them in circuit as bit make sure that the correct tag name appears.

   Click the Compile button so the ladder will be ready for running. For testing the logic you need to click on Run. Both sides of the rung will become green and this is the indication of run mode. Please not that in run mode you can't make changes in the ladder. For modifications user has to go to development mode.

By right clicking on the contact toggle the state of contact. Check the output contact status.

Please remember the ladder contacts or the state of the inputs and outputs are always in de-energised state. The de-energised is that state wherein the contacts are in nonactive state.

You can once again toggle the contact and the output state will change. To add any contact you will have to go to development mode. Click on the rung and add contacts.

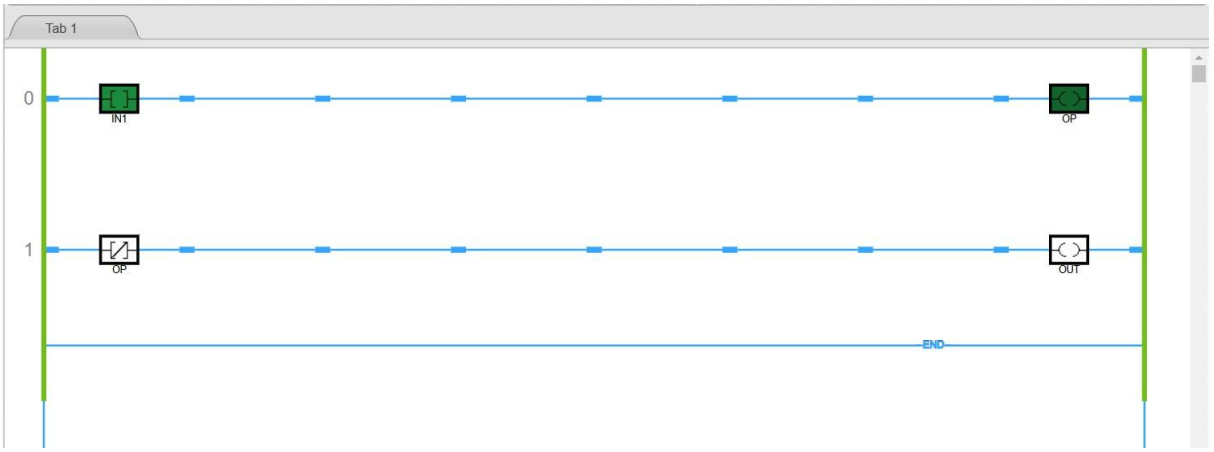
To delete any contact or output right click on the contact and press “delete”, the contact will be deleted.

You can add seven elements in series and 5 elements in parallel.

To add element in parallel click on the node near contact where you wish to add parallel branch. Select the branch and click on the '+' sign to complete the loop. The screen will appear as shown below. Repeat the procedure and verify your logic.

Similarly you can check the logic for OR, NOR, and NAND gates. Validate the truth tables and confirm the results.

2.7. Program and Output: NOT GATE:



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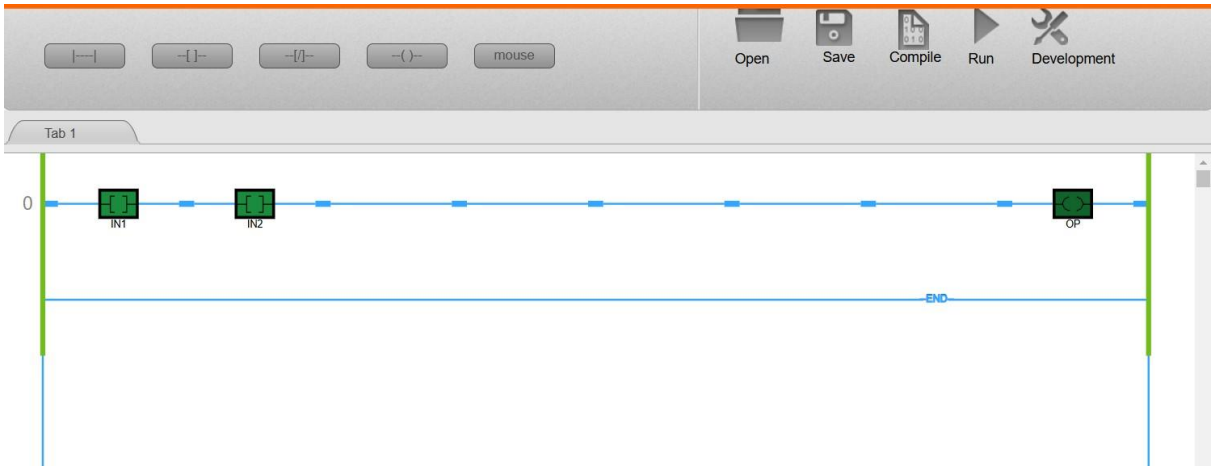
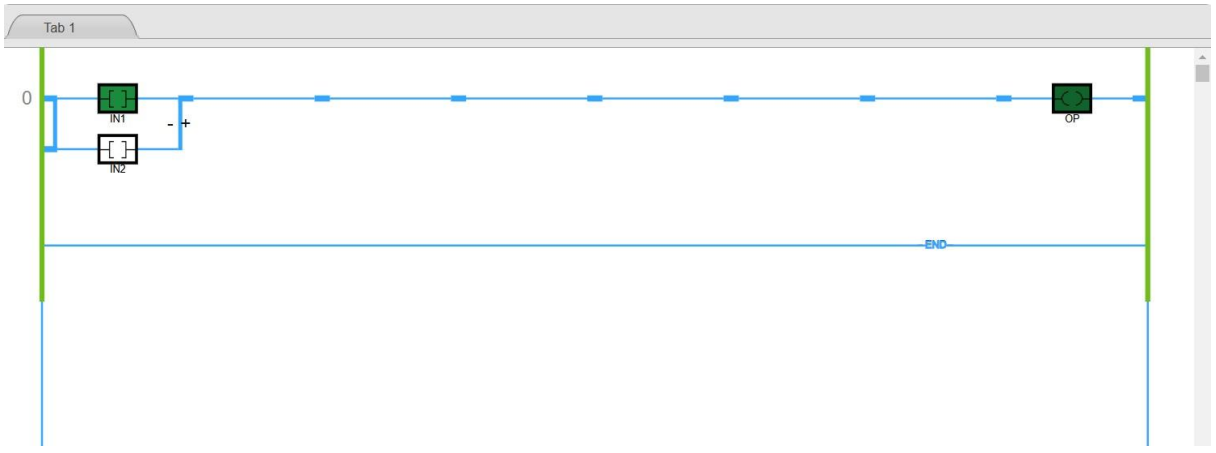
AND GATE



NAND GATE

OR GATE



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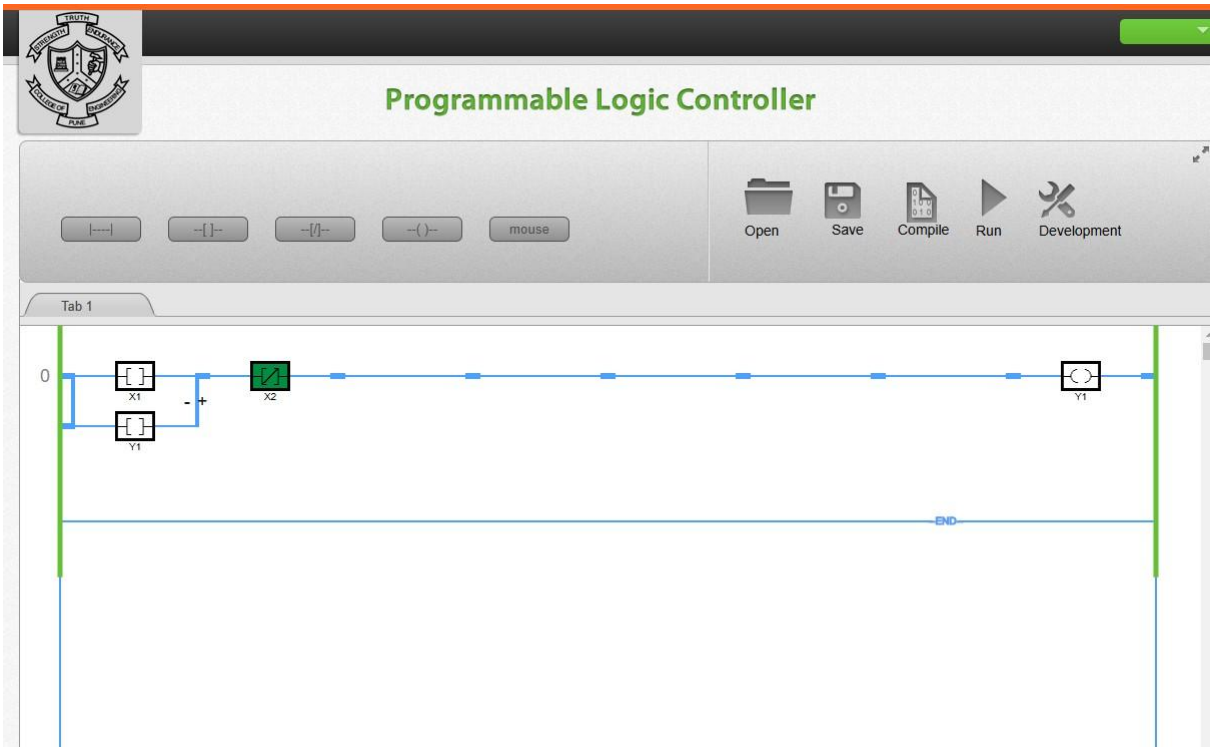
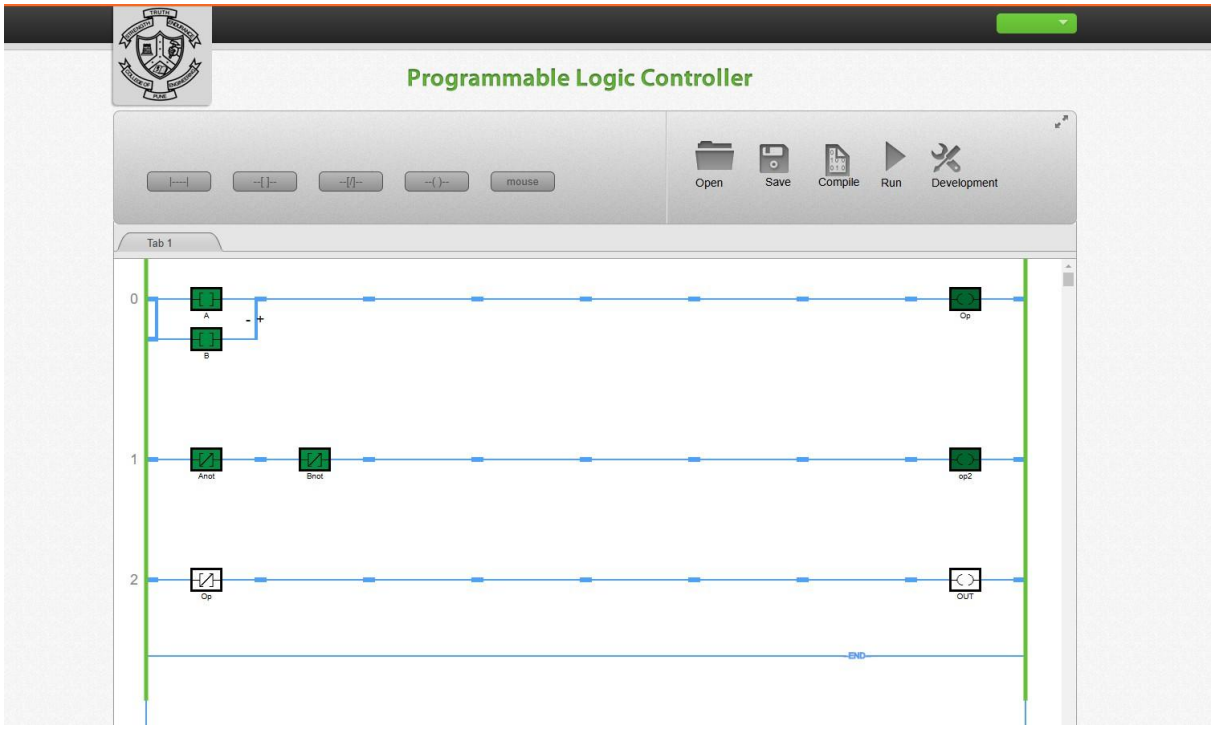
NOR GATE

LADDER LOGIC FOR STOP



DE- MORGANS LAW



2.8 . Conclusion: Hence we successfully learned about the ladder programming and implemented in creating the logic gates.