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| **Course Name:** | **Virtual Instrumentation and Automation lab** | **Semester:** | **V** |
| **Date of Performance:** |  | **Batch No:** | **B1** |
| **Faculty Name:** |  | **Roll No:** | **1912052** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** |  |

**Experiment No: 4**

**Title:** Develop a ladder program for starting an electrical motor using DOL starter

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| **Aim and Objective of the Experiment:** |
| 1. To understand working of DOL starter 2. Develop a ladder program for starting an electrical motor using DOL starter |

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| **COs to be achieved:** |
| CO4: Interface PLC using proper communication device |

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| **Theory:**  **Working of Direct-On-Line (DOL) starter:**  One method of starting electric motors is using direct on line (DOL) or across the line starter. In this  method full line voltage is applied to the motor terminals. This is simplest type of motor starter.  An electrical wiring diagram for single phase DOL starter is shown below.  http://plc-coep.vlabs.ac.in/images/Direct-On-Line.jpg  A DOL motor starter contains fuse and over load relay (OLR) for protection purpose. The starter can be contain momentary contact or maintained contact push buttons. The example considered here is momentary contact push buttons. For starting purpose normally open (NO) push button is preferred whereas normally closed (NC) push button is used to stop the motor.  The excessive supply voltage drop causing high inrush current is the criteria to limit the use of DOL starter. Conveyor motors, water pumps are the applications where DOL starters are used.  **Procedure**  Problem Statement: To start a motor using DOL starter . The simple P&I; diagram for this problem is as below.  http://plc-coep.vlabs.ac.in/images/DOL_P&I%20diagram.jpg  Listing of Input and Output devices:  Inputs: PB1- To start the motor  PB2- To stop the motor  Output: M1- Motor  Sequence of Events : 1. When Start push button (PB1) is pressed, Motor (M1) has to start. 2. If Start pushbutton (PB1) is released and Stop pushbutton (PB2) is not pressed, Motor (M1) should remain on. 3. When Stop push button (PB2 is pressed, Motor (M1) has tol stop. 4. If stop push button is released and start is not pressed (released) motor shouldl remain off.  The Boolean equation to represent this sequence is  http://plc-coep.vlabs.ac.in/images/equation.jpg The ladder diagram to implement these equations is shown below. http://plc-coep.vlabs.ac.in/images/ladder%20diagram%20_1.jpg AS the momentary contact push buttons are used here, the condition of PB1 is maintained through contact of coil C1. This contact is called as latching contact.  The same sequence of event can be executed by using latch and unlatch instruction in the following way.  http://plc-coep.vlabs.ac.in/images/Latch_Unlatch.jpg |
| Stepwise-Procedure: |
| Develop a ladder program for DOL StarterOpen the Simulator window as described in the last experiment 1. The Latch and unlatch instructions are used for holding the output status. 2. The tag name of latch and unlatch output bit must be same. 3. Once you toggle the input bit for the latch; even if you release it by toggling once again, the output bit remains latched. 4. To unlatch the output you will have to toggle the input bit in the unlatch rung and the output will be de-energised. Execute the following ladder on simulator and observe the output status:  http://plc-coep.vlabs.ac.in/images/PLC_Ex3_1.png  You can develop ladder for a DOL “Direct On Line” starter using these instructions. You can also develop the logic using start and stop push buttons as explained under theory tab. Observe the output status at different input conditions. |

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| **Simulation results:** |
| 1. When Start push button (PB1) is pressed, Motor (M1) has to start.    2. If Start pushbutton (PB1) is released and Stop pushbutton (PB2) is not pressed, Motor (M1) should remain on.    3. When Stop push button (PB2 is pressed, Motor (M1) has tol stop.    4. If stop push button is released and start is not pressed (released) motor shouldl remain off. |

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| **Post Lab Subjective/Objective type Questions:** |
| Develop a ladder program for DOL Starter **1. DOL stands for**  a) Digital on line starter  b) Direct on line switch  c) Direct on line starter  Ans: c) Direct on line starter  **2) A DOL motor starter contains---------- for protection purpose.**  a) Relay  b) Switch  c) Over load relay  Ans: c) Over load relay  **3) For starting of an electric motor ----------is preferred**  a) normally open (NO) switch  b) normally open (NO) push button  c) normally closed (NC) push button  Ans: b) normally open (NO) push button  **4) ------------ is the criteria to limit the use of DOL starter**  a) High inrush current  b) Armature Current  c) Size of the motor  Ans: a) High inrush current  **5) In which of the following applications DOL starter can be used**  a) Conveyor belts  b) Water pumps  c) Both a and b  Ans: c) Both a and b  Top of Form |
| **Conclusion:**  Thus we have successfully developed a ladder program for starting an electrical motor using DOL starter in COEP virtual labs. |

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| **Signature of faculty in-charge with Date:** |