071305T4ELC

ELECTRONICS ENGINEERING LEVEL 5

ENG/OS/ET/CR/03/5

Install Electrical Machine Control System

July/August 2025

TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)

PRACTICAL ASSESSMENT

Time: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. A system is controlled by three inputs namely start push button, stop push button and inductive proximity sensor to PLC. The system functions in such a way that when the start push button is pressed, the motor rotates continuously to run the conveyor belt, triggering the green light ON. As the conveyor belt runs, it carries and moves items from one side to the other. If the sensor detects the passing of a magnetic substance, it sends the signal to PLC and the whole process stops, triggering the red light ON. Based on this case, you are required to perform the following tasks:

TASK 1: Draw the block diagram of the project described above, showing the relationship of all inputs to and all outputs from the PLC

TASK 2: Install and wire the PLC system components as they appear in your block diagram.

TASK 3: Configure the PLC software program to execute the required control processes.

TASK 4: Use PLC software to write and debug the ladder logic program shown in figure 1

TASK 5: Upload the ladder logic program to the PLC.

TASK 6: Test and validate the functionality of the system.

3. You have been provided with the following resources for the practical tasks:

i. Programmable Logic Controller (PLC) with min. 4 Digital Inputs, 4 Digital Outputs e.g., Siemens S7-1200, Allen-Bradley, Mitsubishi, Omron e.t.c
ii. Programming device (computer) installed with PLC software
iii. Terminal block (Standard DIN rail mount)
iv. Control Relay module(optional)- 24V DC Coil, 2NO/2NC
v. Conveyor motor: 1 phase or three phase, suitable for belt load
vi. Push buttons (Start and Stop)
vii. Inductive proximity sensor (22mm, 24V/230V AC/DC)-Indicates conveyor running
viii. Green indicator Lights
ix. Red indicator Lights (22mm, 24V/230V AC/DC)-indicates detection/process stopped
x. Power supply (24V DC, 5A (or as required)
xi. Wires (Flexible, multi-strand (1.5 mm^2 or 2.5 mm^2)
xii. Wire stripper
xiii. DIN Rail (35mm standard rail)- For mounting PLC, relays, terminals
xiv. Mounting panel (Wooden/metal board)
xv. Screws, Nuts & Bolts-For mounting devices
xvi. Digital Multimeter
xvii. Crimping tool
xviii. Screwdrivers (flat and Phillips)
xix. Cable cutter
xx. Tester
xxi. Electrical tape

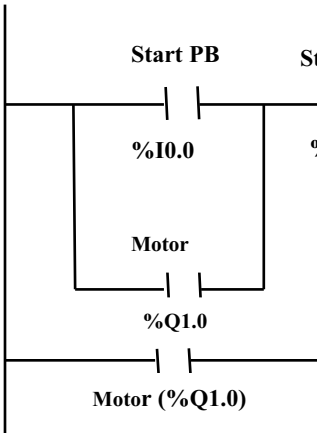

Figure 1 ***CPU ladder Logic program***