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INDUSTRIAL AUTOMATION AND ROBOTICS LEVEL 6

ENG/OS/IA/CR/07/6

Install and Maintain Programmable Logic Controllers

July/August 2025

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

PRACTICAL ASSESSMENT

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Time: 3 HOURS

INSTRUCTIONS TO CANDIDATE:

1. You are required to install and program a system to simulate an automated packaging process that follows the sequence described below.
    a. System start:
        - The system begins when the Start button is pressed.
    b. Product Detection and Conveyor Simulation:
        - When a product is placed in front of Sensor 1 (*Entry Sensor*), it is detected.
        - Upon detection, Indicator Bulb 1 must turn ON, simulating the conveyor in operation.

        N/B: Manually move an object in front of Sensor 1 to simulate product arrival.
    c. Counting and Packaging Logic:
        - After a brief delay, manually move the object to Sensor 2 (*Box Sensor*) to simulate arrival at the packaging box.

- Each time Sensor 2 detects a product, a counter must increment.
- While counting from 1 to 10**,** Bulb 1 must remain ON (conveyor running).
- When the 10^{th} product is detected by Sensor 2:
  - Bulb 1 turns OFF (conveyor stops).
  - Bulb 2 turns ON, simulating a robotic arm transferring the product to a box.
  - Bulb 2 remains ON for 5 seconds, after which:
    - The counter resets to 0.
    - The system becomes ready for the next packaging cycle.

d. Reset and repeat:

- After a full cycle, the system should automatically reset and be ready to detect the next product.

a. Stop condition:

- Pressing the Stop button must immediately halt all operations.

Tasks:

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i. **Task 1:** Install the system:
   - Install the system components as described in the instructions above.

ii. **Task 2:** Develop the PLC program:
   - Create an I/O distribution list.
   - Develop the PLC program to accomplish the entire sequence of events

iii. **Task 3:** Test and operate the system.
   - Power up the system.
   - Perform all relevant tests to verify correct operation.
   - Upload the developed program to the PLC.
   - Run the system and observe functionality

2. You have been provided with the following resources for the practical tasks:
    - 2 Push Buttons NO/NC
    - Cables (Red, Yellow, Blue)
    - 2 Proximity Sensors
    - 2 Bulbs (75W, 240V)
    - 2 Bulb Holders
    - PLC
    - PLC Programming Cable
    - 2 Terminal Blocks
    - DIN Rail
    - Mini trunk
    - Tuck Nails
    - Equipment label
    - Multimeter
    - Side cutter
    - Installation Board
    - Screw Driver Set
    - Hammer
    - M.C.B
    - 240V AC Power supply
    - 12/24V DC (Depending on the controller)

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