

071605T4MCT

MECHATRONICS TECHNOLOGY LEVEL 5

ENG/OS/MC/CR/04/5

Operate Robotic and Automated Systems

July/August 2025



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

PRACTIC	SSMENT
Tim	RS

INSTRUCTIONS TO CANDIDATE

1. Do not write on the question paper
2. DO NOT switch ON the power without the assessor's permission
3. The assessor will assess your performance at critical points and may record your performance using audio-visual means.

This paper consists of THREE (3) printed pages.

The candidate should check the question paper to ascertain that all pages are printed as indicated and that no pages are missing.

- A. You are required to perform the following tasks on a pick-and-place robot arm;
1. Prepare the robot installation area by clearing the workspace of unnecessary materials, mounting the pick-and-place robot arm on a stable platform, ensuring the emergency stop button is accessible, connecting the PLC to a reliable power source, and verifying that the PLC panel is correctly wired and closed.
 2. Create and configure the PLC tag table by identifying the exact input and output devices involved in the process, including the start push button (digital input), object detection sensor (digital input), gripper actuator (digital output), and robot motion relay outputs (digital outputs). Assign each device a specific tag name and I/O address in the PLC programming environment, and validate that each input and output is responsive using the PLC monitoring tool.
 3. Program the pick-and-place sequence using the PLC by developing ladder logic that energizes motion outputs to drive the robot to the pick position, activates the gripper output to hold the object, moves the robot to the place position, deactivates the gripper to release the object, and returns the robot to the home position. Implement a counter i logic to repeat this cycle exactly three times, and include a condition t tically stop the sequence after the third cycle.
 4. Debug and test the PLC program by switching the PLC to test mode, simulating all input conditions using the actual push button and object detection sensor, observing each robot movement step in response to the PLC outputs, and checking the counter increment on each completed cycle. Adjust the ladder logic to correct any misbehaviour such as skipped steps, improper gripper activation, or inaccurate stop condition.
 5. Run the pick-and-place system in real operation by pressing the start push button, allowing the PLC to control all robot movements in sequence for three complete cycles, observing that the inputs and outputs function as expected in each step, and confirming that the system halts automatically after the third cycle. Record any delays, misaligned motions, or sensor misreadings for refinement.

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

- i. 1 workpiece (lightweight item like a plastic cube)
- ii. End-effector gripper (pneumatic)
- iii. Robotic arm setup
- iv. Host computer with robot programming software
- v. Compressed air supply
- vi. PLC module
- vii. Programming cable
- viii. Set of screw drivers (flat and star)
- ix. Set of Allen Keys
- x. Side cutter
- xi. Digital Multimeter
- xii. 240 VAC power supply
- xiii. 24V DC power supply