

SAMPLE PAPERS**DIPLOMA FIFTH SEMESTER EXAMINATION 2025 (JUT)****AUTOMATION & ROBOTICS****DIPLOMA WALLAH**[CLICK HERE TO VISIT DIPLOMA WALLAH WEBSITE](#)*(MADE WITH ❤ BY SANGAM)*

Full Marks: 70 marks | Time: 3 Hours

Instructions:

- Question No. 1 is compulsory.
- Answer any **FOUR** questions from the remaining (Q.2 to Q. 7 marks).

SECTION A (Compulsory)**Q.1 Multiple Choice Questions (7 × 2 = 14 Marks)**

(i) Which level of the automation hierarchy is responsible for the direct monitoring and control of the physical process?

- (a) Enterprise Level
- (b) Supervisory Level
- (c) Control Level
- (d) Field Level

(ii) In a PLC, the time required to execute the user program once and update I/O is called:

- (a) Response time
- (b) Scan cycle time
- (c) Execution time
- (d) Delay time

(iii) Which type of proximity sensor is best suited for detecting non-metallic objects like liquids or plastic granules?

- (a) Inductive Proximity Sensor
- (b) Capacitive Proximity Sensor
- (c) Magnetic Proximity Sensor
- (d) Hall Effect Sensor

(iv) The "SCARA" robot configuration stands for:

- (a) Selective Compliance Assembly Robot Arm
- (b) Simple Control and Robotic Automation

- (c) Standard Cartesian Assembly Robot Arm
- (d) Synchronized Control Articulated Robot Arm
- (v) Which joint type provides a twisting motion (rotational about the link axis)?
 - (a) L-Joint
 - (b) V-Joint
 - (c) T-Joint
 - (d) O-Joint
- (vi) In a Flexible Manufacturing System (FMS), a "Dedicated FMS" is characterized by:
 - (a) Handling a wide variety of parts in random order
 - (b) Producing a limited variety of parts at higher production rates
 - (c) Using only manual workstations
 - (d) Having no automated material handling
- (vii) What is the primary function of a DAC (Digital-to-Analog Converter) in an automation system?
 - (a) Converting sensor signals to digital data for the CPU
 - (b) Storing the PLC program
 - (c) Converting CPU digital output to analog signals for actuators
 - (d) Converting AC power to DC power

Q.2

(A) Define Industrial Automation. Explain the necessity and various benefits of implementing industrial automation in modern manufacturing, particularly in the automotive industry. [7]

(B) Draw and explain the Automation Hierarchy (pyramid) used in industrial control systems. Briefly describe the function of each level. [7]

Q.3

(A) Compare and contrast Relay Logic Control with Programmable Logic Controller (PLC) Logic Control systems, highlighting their advantages and disadvantages. [7]

(B) Draw the Internal Architecture of a PLC and explain the function of its major components, including the CPU, I/O Modules, and Memory organization. [7]

Q.4

(A) Explain the construction, working principle, and applications of the following Proximity Switches: Inductive, Capacitive, and Photoelectric Sensors. [7]

(B) Explain the construction, working, and applications of Stepper Motors and Servo Motors used as actuators in automation systems. [7]

Q.5

(A) Define a Robot and explain the need for using Robotics in industrial manufacturing. List and explain the primary Specifications of an Industrial Robot. [7]

(B) Explain the different Configurations of Robots (e.g., Articulated, Polar, SCARA, Cartesian) with the help of simple sketches. [7]

Q.6

(A) Explain the application of robots in Arc Welding. Describe the essential Arc Welding Application commands and the importance of Weld Parameters. [7]

(B) Describe the various Robot Programming Methods (Teach Pendant, Languages, Offline Programming), explaining the advantages of Offline Programming. [7]

Q.7 Write Short Notes on ANY FOUR of the following: (4 × 3.5 = 14 Marks)

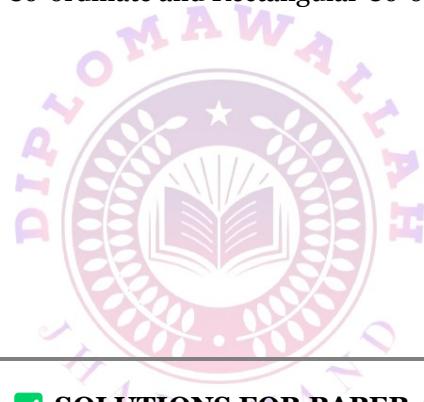
(a) Importance of TCP (Tool Center Point Definition)

(b) Difference between Grippers and Tools

(c) Low Air Pressure Interlock system

(d) Ladder logic diagram for basic logic gates (AND, OR)

(e) Difference between Joint Co-ordinate and Rectangular Co-ordinate System



SOLUTIONS FOR PAPER 1

MCQ Answer Key:

(i) d, (ii) b, (iii) b, (iv) a, (v) c, (vi) b, (vii) c

Short Answer/Model Answer Hints:

- **Q.2(A):** Define automation (tech to control processes). Necessity: Quality, speed, safety. Benefits: Reduced labor cost, higher accuracy, 24/7 operation.
- **Q.2(B):** Pyramid: Level 0 (Sensors/Actuators), Level 1 (PLC/PID), Level 2 (SCADA), Level 3 (MES), Level 4 (ERP).
- **Q.3(A):** Relay: Hardwired, bulky, hard to troubleshoot. PLC: Programmable, flexible, diagnostic features.
- **Q.3(B):** CPU (Processing), Memory (RAM/ROM), I/O (Interface with field), Power Supply, Bus.
- **Q.4(A):** Inductive (Metal), Capacitive (Dielectric change), Photoelectric (Light interruption).
- **Q.4(B):** Stepper (Open loop, steps), Servo (Closed loop, feedback).

- **Q.5(A):** Definition (reprogrammable manipulator). Specs: Payload, Reach, Precision, Speed.
- **Q.5(B):** Sketches of Cartesian (PPP), Cylindrical (RPP), Polar (RRP), Articulated (RRR), SCARA.
- **Q.6(A):** Consistent weld quality. Commands: ARCON, ARCOFF, WEAVON. Parameters: Voltage, Current, Speed.
- **Q.6(B):** Teach Pendant (Manual), Offline (Simulation on PC, no downtime).
- **Q.7:** (a) TCP defines the tip of the tool for accurate path following. (b) Grippers hold; Tools perform work. (c) Safety feature to stop gripper if air pressure drops. (d) Series contacts (AND), Parallel (OR). (e) Joint (angles of motors), Rectangular (X, Y, Z space).

