

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 ($7 \times 2 = 14$ Marks)

(i) Which type of robot drive system is known for cleanliness and is commonly used in small robots for precise tasks, but lacks high force capability?

- (a) Hydraulic Drive
- (b) Pneumatic Drive
- (c) Electric Drive
- (d) Mechanical Drive

(ii) The number of independent movements a robot manipulator can perform is known as:

- (a) Work Volume
- (b) Payload
- (c) Degrees of Freedom (DOF)
- (d) Repeatability

(iii) In PLC programming, a "retentive" timer:

- (a) Resets automatically when power is lost
- (b) Maintains its accumulated time value even if the rung goes false
- (c) Cannot be reset
- (d) Counts input pulses instead of time

(iv) Which of the following is an example of a "Contact" sensor?

- (a) Limit Switch
- (b) Inductive Sensor

- (c) Ultrasonic Sensor
 - (d) Photoelectric Sensor
 - (v) An AGV (Automated Guided Vehicle) system that uses a camera to follow a painted line or tape on the floor uses which guidance technology?
 - (a) Wire guidance
 - (b) Inertial guidance
 - (c) Optical/Visual guidance
 - (d) Laser guidance
 - (vi) The IEC 1131-3 standard defines which of the following as a graphical programming language for PLCs?
 - (a) Ladder Diagram (LD)
 - (b) C++
 - (c) Python
 - (d) Assembly Language
 - (vii) What is the function of an "End Effector" in robotics?
 - (a) To supply power to the robot
 - (b) To process sensor data
 - (c) To interact with the environment (grip or work)
 - (d) To store the robot program
-

SECTION B (Theory)

(Answer any FOUR questions from Q.2 to Q.7)

Q.2

- (A) Discuss the key development milestones in the history of automation technology and analyze the effects of automation on people (employment, skills). [7]
- (B) Explain the working principle and application of Timer functions (On-Delay and Off-Delay) and Counter functions in PLC programming. [7]

Q.3

- (A) Describe the working principle and industrial application of different types of Input Devices: Strain Gauges, Pressure Sensors, and Resistive Temperature Detectors (RTDs). [7]
- (B) Explain the principle of operation for Analog-to-Digital Converters (ADC) and Digital-to-Analog Converters (DAC). Why are they crucial in automation? [7]

Q.4

- (A) Draw the Block Diagram of an Embedded System and explain the role of each component. List at least four key Applications of Embedded Systems in the automotive sector. [7]

(B) Define Flexible Manufacturing Systems (FMS). Explain the different types of FMS and detail the essential Components of FMS. [7]

Q.5

(A) Describe the Basic Components of an Industrial Robot (Base, Link, Joint, Wrist, End effector, Actuator, Sensor, Controller). Draw a neat diagram. [7]

(B) Define Degree of Freedom (DOF). Explain the six basic degrees of freedom (Forward/Back, Up/Down, Left/Right, Pitch, Yaw, Roll). [7]

Q.6

(A) Differentiate between the three main types of Robotic Drives: Electric, Pneumatic, and Hydraulic Drives. [7]

(B) What are End Effectors? Differentiate between Grippers and Tools. List the factors considered for selecting a Gripper. [7]

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

(a) SCADA system relation to automation hierarchy

(b) Via Point vs Process Point

(c) Encoders (Working & Use)

(d) Types of FMS Layout Configurations

(e) Smart Sensors



SOLUTIONS FOR PAPER 2

MCQ Answer Key:

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

Short Answer/Model Answer Hints:

- **Q.2(A):** History: Mechanics -> Relay -> PLC -> AI. Effects: Job displacement vs Job creation (higher skill).
- **Q.2(B):** TON (Delay start), TOF (Delay stop), CTU (Count up), CTD (Count down).
- **Q.3(A):** Strain Gauge (Resistance change with deformation), Pressure (Piezoelectric/Diaphragm), RTD (Temp-Resistance linearity).
- **Q.3(B):** ADC: Sensor (Analog) -> CPU (Digital). DAC: CPU (Digital) -> Actuator (Analog).
- **Q.4(A):** Processor, Memory, I/O, Timer. Auto Apps: ABS, ECU, Airbag, Infotainment.
- **Q.4(B):** Flexible routing/processing. Types: Dedicated, Random order. Components: Workstation, Material handling, Control.
- **Q.5(A):** Diagram showing Arm, Wrist, Base, Controller.
- **Q.5(B):** 3 Translations (X,Y,Z) + 3 Rotations (Pitch, Yaw, Roll).
- **Q.6(A):** Electric (Accurate, clean), Hydraulic (Strong, messy), Pneumatic (Fast, weak/compliant).
- **Q.6(B):** Gripper: Physical hold. Tool: Process (Weld/Paint). Factors: Part weight, shape, material.
- **Q.7:** (a) Supervisory level for data acq. (b) Via (pass through), Process (stop/act). (c) Position feedback. (d) Inline, Loop, Robot-centered. (e) Sensor + Signal processing.