

AUTOMATION & ROBOTICS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART - A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Define the term "Automation".
 - List out the classification of automated manufacturing systems.
 - What do you mean by "Line efficiency" of an assembly line?
 - Classify the work part transfer mechanisms.
 - Name the basic robot configurations (arm and body).
 - Define "Detent torque" with respect to a stepper motor.
 - Write the rotational matrix for a rotating of " θ " angle about Z-axis.
 - What do you mean by "Inverse kinematics"?
 - Define a "Robot programming".
 - List out the industrial robot applications in manufacturing.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

- 2 Explain the three basic elements of an automated system.

OR

- 3 Explain the various levels of automation with their hierarchy in a production plant.

UNIT - II

- 4 What is storage buffer and why these are used in automated production lines?

OR

- 5 Explain the different types of manual assembly lines with respect to product variety.

UNIT - III

- 6 Sketch and explain in brief a polar coordinate robot with a three axis wrist.

OR

- 7 Sketch and explain the position sensor of potentiometer type.

UNIT - IV

- 8 For the vector $25i + 10j + 20k$, perform the following homogeneous transformations:

- Rotation 90° about X-axis.
- Translation by 8 units in X-direction, 5 units in Y-direction and zero in the Z-direction.

OR

- 9 A jointed – arm robot of configuration RRR is to move all three axes so that the first joint is rotated through 50° , the second joint is rotated through 90° and the third joint is rotated through 25° . Maximum speed of any of these rotational joints is $10^\circ/\text{S}$. By ignoring the effects of acceleration and deceleration determine: (i) The time required to move each joint if skew-motion is used. (ii) The time required to move the arm to the desired position and the rotational velocity of each – joint, if joint – interpolation motion is used.

UNIT - V

- 10 Explain the different ways of accomplishing lead through method of robot programming.

OR

- 11 Explain the features and capabilities required for an arc welding robot.
