Code: 13A03702

B.Tech IV Year I Semester (R13) Supplementary Examinations June 2017
AUTOMATION & ROBOTICS
(Mechanical Engineering)

Time: 3 hours   Max. Marks: 70

PART - A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
   (a)   Define the term "Automation".
   (b)   List out the classification of automated manufacturing systems.
   (c)   What do you mean by "Line efficiency" of an assembly line?
   (d)   Classify the work part transfer mechanisms.
   (e)   Name the basic robot configurations (arm and body).
   (f)   Define "Detent torque" with respect to a stepper motor.
   (g)   Write the rotational matrix for a rotating of "θ" angle about Z-axis.
   (h)   What do you mean by "Inverse kinematics"?
   (i)   Define a "Robot programming".
   (j)   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:
         (a) Rotation 90° about X-axis.
         (b) 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°/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.

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