Code No: R32032 **R10** **Set No: 1**

III B.Tech. II Semester Supplementary Examinations, January -2014

ROBOTICS

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. (a) Describe the classification of robots by control system. (7+8M)
   (b) Explain how robotics is a technology for future.

2. (a) Write a short note on electric type of locomotion devices. (7+8M)
   (b) How does end effectors are determined in industrial robots?

3. (a) For the vector v = 25i +10j +20k, perform a translation by a distance of 8 in the x direction, 5 in the y direction, and 0 in the z direction. The translation transformation would be

$$H = Trans\ (a,b,c) = \begin{pmatrix} 1 & 0 & 0 & 8 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

   (b) Rotate the vector v = 5i + 3j +8k by the angle of 90º about the x axis. The rotation transformation is given by

$$H = Rot\ (x,90) = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos 90 & -\sin 90 & 0 \\ 0 & \sin 90 & \cos 90 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$ (7+8M)

4. (a) What is Denavit-Hartenberg notation?
   (b) Discuss the reverse transformation of the 2-degree of freedom arm. (5+10M)

5. (a) Explain about static forces in manipulators
   (b) Explain about Jacobians in the force domain (7+8M)

6. What are the common types of motion that a robot manipulator can make in travelling from point to point? (15 M)

7. (a) Write a short note on potentiometers and resolver.
   (b) What is the use of velocity sensors. (8+7M)

8. Explain how robots are applied in loading and unloading functions with any three production operations. (15M)

*****

Code No: R32032 **R10** **Set No: 2**

III B.Tech. II Semester Supplementary Examinations, January -2014

ROBOTICS

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. (a) Describe the classification of robots by co-ordinate system.
   (b) Explain how robotics is helpful in science fiction? (7+8M)

2. (a) Write a short note on hydraulic type of locomotion devices.
   (b) What are the requirements and challenges of end effectors? (7+8M)

3. Discuss how kinematic equations are obtained using homogeneous transformations with a neat sketch. (15M)

4. (a) Explain about Actuator space, joint space and Cartesian space
   (b) Discuss a 3-Degree of freedom arm in two dimensions with the help of a neat sketch. (7+8M)

5. Explain closed form dynamic equations with an example (15M)

6. (a) Discuss about the skew motion a robot manipulator can make in travelling from point to point.
   (b) Identify the two generations of textual languages and speculate about what a future generation might be. (7+8M)

7. (a) Write a short note on encoders.
   (b) Discuss about stepper motors. (5+10M)

8. (a) How robots are helpful in spray coating?
   (b) What are the advantages and benefits of robot arc welding? (7+8M)

*****

Code No: R32032 **R10** **Set No: 3**

III B.Tech. II Semester Supplementary Examinations, January -2014

ROBOTICS

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. (a) Explain how industrial robot is used as general purpose in industries?
   (b) Write the present and future applications of robots. (7+8M)

2. (a) Write a short note on pneumatic type of locomotion devices.
   (b) What are the different components of industrial robotics? (7+8M)

3. (a) For the vector v = 25i +10j +20k, perform a translation by a distance of 8 in the x direction, 5 in the y direction and 0 in the z direction. The translation would be

$$H = Trans\ (a,b,c) = \begin{pmatrix} 1 & 0 & 0 & 8 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

   (b) Rotate the vector v = 5i +3j + 8k by an angle of 90º about the x axis. The rotation transformation is given by

$$H = rot\ (x,90) = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos 90 & -\sin 90 & 0 \\ 0 & \sin 90 & \cos 90 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$ (7+8M)

4. (a) Explain the geometric form of the RR manipulator with a neat sketch (7+8M)
   (b) Discuss a 4-degree of freedom manipulator in three dimensions with a neat sketch.

5. Explain closed form dynamic equations with an example (15M)

6. (a) Discuss about the joint interpolation motion a robot manipulator can make in travelling from point to point.
   (b) Identify the two generations of textual languages and speculate about what a future generation might be. (7+8M)

7. (a) Write a short note on resolvers.
   (b) Discuss about electric motors. (5+10M)

8. (a) How a robot can perform arc welding process?
   (b) What are the benefits of robot spray coating? (8+7M)

*****

Code No: R32032 **R10** **Set No: 4**

III B.Tech. II Semester Supplementary Examinations, January -2014

ROBOTICS

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. What is industrial automation? Broadly classify industrial automation. (15M)

2. (a) Explain the function line diagram representation of robot arm.
   (b) What are the common types of robot arms in use? (8+7M)

3. Discuss how kinematic equations are obtained using homogeneous transformations with a neat sketch. (15M)

4. (a) Discuss the reverse transformation of the 2-degree of freedom arm.
   (b) Define repeatability and accuracy of a manipulator (10+5M)

5. Explain iterative Newton-Euler dynamic formulation (15M)

6. (a) Discuss about the straight line motion a robot manipulator can make in travelling from point to point.
   (b) Identify the two generations of textual languages and speculate about what a future generation might be. (7+8M)

7. (a) Write a short note on potentiometers.
   (b) Discuss about pneumatic and hydraulic actuators. (5+10M)

8. How robots are applied in assembly operations? Explain in detail. (15M)

*****