

IV B.Tech II Semester Regular Examinations, Apr/May 2006

ROBOTICS

(Computer Science & Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Describe the functions of the four basic types of a robot. [16]
2. (a) Enumerate the advantages and limitations of Lead through method robot languages and Textual robot languages.
(b) What are position sensors? What are the different types of position sensors? [8+8]
3. Define rotation transformation and explain how to represent the transformation for rotation of an angle ' θ ' about x , y and z-axis. [16]
4. Explain the method of expressing the translational velocities of an object moving in space. [16]
5. Derive the equations of motion for the two link manipulator in figure 1 using the Lagrangian-Euler formulation. Let l_{g1} be the distance between joint 1 and the center of mass of link 1, let m_1 be the mass of link i , and let \tilde{I}_i be the moment of inertia about the center of mass of link i . Assume that gravity acts vertically downward. [16]

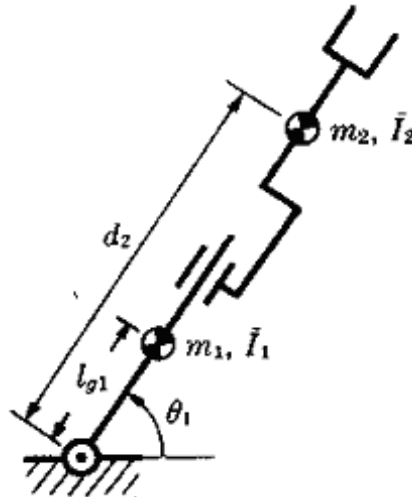


Figure 1:

6. What are the various methods for determining a desired trajectory of joint? Discuss any one method in brief. [16]

7. Illustrate a robot gripper with
- (a) pneumatic operated
 - (b) hydraulic operated [8+8]
8. What is machine vision? Explain the techniques of image processing. [16]

★ ★ ★ ★ ★

IV B.Tech II Semester Regular Examinations, Apr/May 2006
ROBOTICS

(Computer Science & Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. With the help of line diagram explain basic components of a Robot system. [16]
2. Discuss principle of tactile sensor used in Robots. What are the different types of tactile sensors? Explain any one type with suitable sketch. Discuss the applications, limitations and advantages tactile sensors. [16]
3. (a) Explain briefly about Euler angles.
(b) Write the homogenous transform matrix for a rotation of 90° about the z axis followed by a rotation of -90° about the axis, followed by a translation of (3, 7, 9)
[6+10]
4. Explain the method of expressing the translational velocities of an object moving in space. [16]
5. Draw a two link manipulator and mark the various parameters on it. Derive the equations of motion using the Lagrangian formulation for this configuration. [16]
6. What is hybrid control? Explain the hybrid control of manipulation. [16]
7. (a) Discuss the working principle and applications of pneumatic gripper.
(b) Explain the difference between an encoder and position sensor? Is a position sensor used in combination with a servomotor based system? [8+8]
8. With a block diagram describe the elements and their functions of a machine vision system for robotic applications. [16]

IV B.Tech II Semester Regular Examinations, Apr/May 2006**ROBOTICS****(Computer Science & Engineering)****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions
All Questions carry equal marks**

1. Discuss the anatomy of Robot and explain the important parts of a robot with a neat sketch. [16]
2. (a) With the help of block diagram, explain the structure of robot language.
(b) Briefly explain the following sensors:
 - i. Tactile sensors
 - ii. Range sensors. [6+10]
3. Show how to add two vectors represented in Homogeneous coordinates with different scale factors. What is the scale factor of the point? [16]
4. Find the Jacobian matrix for the three-link planar manipulator shown in figure 1. [16]

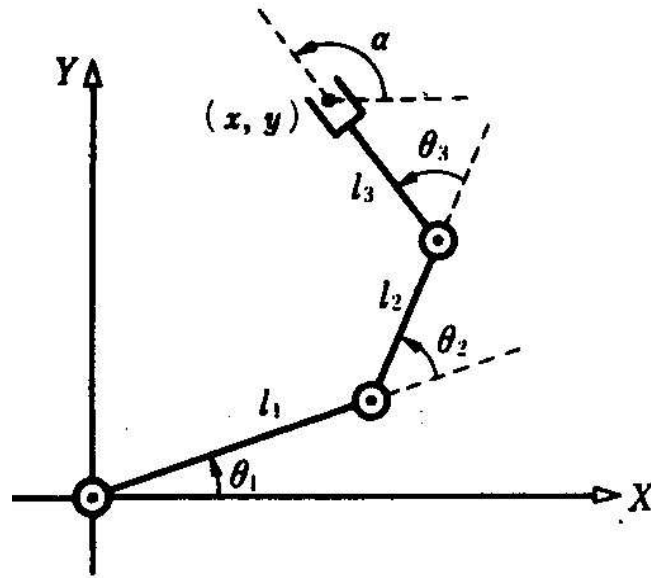


Figure 1:

5. Explain the Lagrange Euler's formulation for robot arm. [16]
6. What is hybrid control? Explain the hybrid control of manipulation. [16]
7. What is the function of the Gripper? What are the different types of Grippers used in Robots? Discuss any two types of Grippers with the help of neat diagrams. [16]

8. Explain the various techniques of image processing in the machine vision system.
[16]

IV B.Tech II Semester Regular Examinations, Apr/May 2006
ROBOTICS

(Computer Science & Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Discuss the anatomy of Robot and explain the important parts of a robot with a neat sketch. [16]
2. Discuss the textural robot language structure with the help of block diagram. [16]
3. Find the composite rotation matrix representing the following.
 - (a) A rotation of about y-axis
 - (b) A rotation of θ about w-axis and
 - (c) A rotation of α about u-axis. [5+5+6]
4. Discuss inverse kinematics solutions used for robot controller using Jacobian matrix transformations. Why unique solutions cannot be obtained for inverse kinematics and suggest suitable algorithm to tide over the situation? [16]
5. Explain the application of Lagrangian Euler equations for a two link planar manipulator having masses m_1 , m_2 and lengths d_1 , d_2 and joint angles θ_1 , θ_2 . [16]
6. Draw the block diagram of hybrid control system and explain briefly. [16]
7. What is the function of gripper? Discuss various types of Grippers used in industrial Robots. [16]
8. Explain the applications of robots in loading and unloading. [16]
