www.FirstRanker.com www.FirstRanker.com www.FirstRanker.com

Code: R7410305

R07

B.Tech IV Year I Semester (R07) Supplementary Examinations, May 2013

ROBOTICS

(Mechanical Engineering)

Time: 3 hours Max. Marks: 80

Answer any FIVE questions
All questions carry equal marks

*****

1. Explain about cartesian coordinate, cylindrical coordinate and spherical coordinate systems with neat sketches.

2. Name and major components of a robot system, and describe each of them in detail.

3. (a) With neat sketches explain about pure translation and pure rotation.
   (b) Find the transformation matrices for the following operations on the point P=[6 2 3]^T
   (i) Rotate 45 degrees about x-axis and then translate -2 units along y-axis (ii) Translate 2 units along x-axis and rotate 60 degrees about y-axis.

4. (a) How does direct kinematics differ from inverse kinematics?
   (b) Obtain the D-H link parameters for the manipulator shown in figure 1.

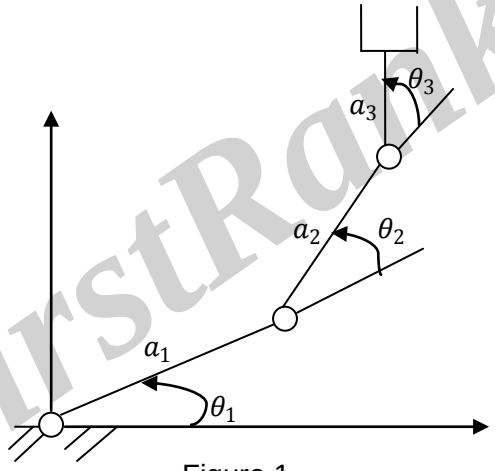

Figure 1

5. (a) Our desire is to position the origin of the hand frame of a cylindrical robot at point P=[6, 8, 7]^T. List the sequence of transformation need to place the origin of the hand frame at P and find resultant transformation matrix. Also calculate the joint variables of the robot.
   (b) Write a short note on the robot Jocobian matrix.

6. It is desired to have the first joint of a six-axis robot go from initial angle of 20 degrees to a final angle of 50 degrees in 5 second. Using a third-order polynomial, calculate the joint angle at 1,2,3 and 4 seconds assuming the initial and final velocities are zero degrees/sec.

7. (a) Discuss about hydraulic actuators.
   (b) List the advantages and disadvantages of hydraulic and electrical actuators.

8. Enumerate the advantages and limitation of using robots in following applications.
   (i) Welding (ii) Spray painting.

*****

FirstRanker

www.FirstRanker.com