

IV B.Tech I Semester Supplementary Examinations, April/May 2005
ROBOTICS
(Common to Mechanical Engineering, Mechatronics and Production
Engineering)

Time: 3 hours**Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

1. Write a detailed notes about Flexible Automation, with applications.
2. With reference to robot gripper, explain with suitable examples, the electric, pneumatic and hydraulic drivesystems.
3. Explain the difference between Cartesian coordinate representation and Homogeneous coordinate representation with an example.
4. Considering a jointed arm robot manipulator with its x, y and z axes aligned with a reference Cartesian co-ordinate frame but located at $\{x, y\} = \{3 \text{ mt}, -2 \text{ mt}\}$ the end of arm of the robot is currently at $\{x, y, z\} = \{4 \text{ mt}, 1 \text{ mt}, 2 \text{ mt}\}$ relative to the reference co-ordinate frame. As end effector is 0.5 mt in length is attached to the end of arm is pointing vertically down. Relative to the tip of the end effector is a cube with 15 mm on a side and with its nearest corner positioned 0.5 mt in the x direction 1 mt in y direction and 0 mt in z direction from the tip of the end effector. For the above description make the sketch of work volume cell.
5. Find the manipulator Jacobian matrix $J(q)$ of the five axis spherical co-ordinate robot.
6. Develop the general expressions for kinetic energy and potential energy of an element of a robotic manipulator.
7. A single- link robot with a rotary joint is motionless at $\theta=15$ degrees. It is desired to move the joint in a smooth manner to $\theta = 75$ degrees in 3 second. Find the coefficients of a cubic which accomplishes this motion and brings the manipulator to rest at the goal. Plot the position, velocity and acceleration of the joint as a function of time.
8. (a) Draw the figure of a hydraulic system of robot and show how the out put shaft velocity is proportional to the flow of the oil in motor-pump combination for a hydraulic system.
(b) Compare and contrast hydraulic and Electrical actuators.
