

R7

Code: R7411306

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

ROBOTICS AND AUTOMATION**(Electronics & Control Engineering)**

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 With neat sketches explain about rectangular coordinate, cylindrical coordinate and polar coordinate systems.
- 2 Compare the electrical drives and hydraulic drives for robot manipulator in respect of the following factors:
 - (a) Power.
 - (b) Efficiency.
 - (c) Power to weight ratio.
 - (d) Working fluid.
- 3 Explain the variable structure systems for the control of manipulators.
- 4
 - (a) Discuss about important consideration in the design of gripper.
 - (b) Discuss the working principle and applications of pneumatic gripper.
- 5
 - (a) With neat sketches define roll, pitch yaw angles.
 - (b) Find the transformation matrices for the following operations on the point $P = [3 \ 4 \ 5]^T$:
 - (i) Rotate 60 degrees about z-axis and then translate -4 units along y-axis,
 - (ii) Translate 3 units along z-axis and rotate 90 degrees about y-axis.
- 6 What is inverse kinematics problem? Explain the solution to the inverse kinematics problem with an example.
- 7
 - (a) Discuss about third-order polynomial trajectory planning.
 - (b) A single cubic trajectory is given by $\theta(t) = 10 + 25t^2 - 5t^3$, and is used over a time interval from $t = 0$ to $t = 2$ seconds. What are the starting and final positions, velocities and accelerations?
- 8
 - (a) What are the various applications of robots in hazardous areas? Discuss them in detail.
 - (b) Discuss about robot applications in non-manufacturing industries.
