PVP 12

Code: **MEMD2T3**

I M.Tech-II Semester-Regular Examinations-December 2013

ADVANCED ROBOTICS
(MACHINE DESIGN)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

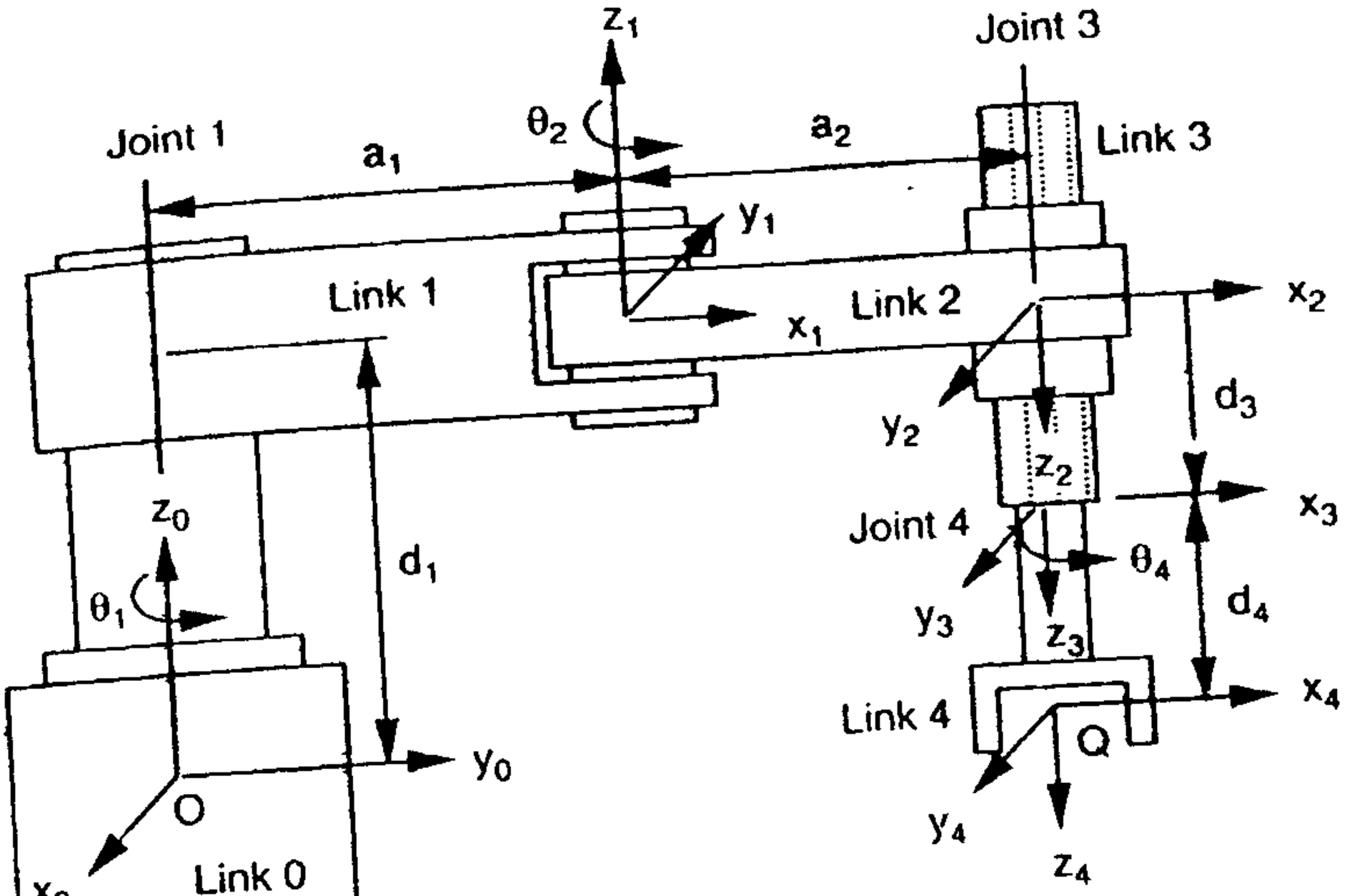
1. a) What is the work envelope of a robot? Sketch and explain two views to indicate the work envelope of
   i) cylindrical robot.
   ii) Jointed arm robot
   7M

   b) Describe the functions of the four basic types of a robot. 7M

2. a) What is homogeneous transformation? Explain how transformations can be combined. 7M

   b) What are the results of rotation of matrix for a rotation of 30^0 about the fixed X- axis, followed by rotation of 60^0 about the Y-axis, followed by rotation of 45^0 about the Z-axis? For the above rotations find the direction of the screw axis and angle of rotation. 7M

3. Solve the inverse kinematics of the 4-dof SCARA arm. 14M



4. a) Find the Jacobian matrix for the three-link planar RRR manipulator. 7M

b) Explain the method of expressing the translational velocities of an object moving in space. 7M

5. a) Derive the equations of motion for the two link manipulator on the basis of Lagrangian formulation. 7M

b) Explain static force analysis of robots. 7M

6. a) A robot manipulator is rotating from 30 degree to 75 degrees in 5 seconds. Using a third order polynomial calculate the joint angles, velocities and accelerations at 1,2,3 and 4 seconds. 7M

b) What are interlocks? How can they be prevented? 7M

7. a) Describe briefly the application of stepper motors in motion control of robotic manipulators. 7M

b) What are actuators and transmission system? Discuss any two electrical actuators. 7M

8. Explain in detail about the following.
   i) Optical interpreter
   ii) Reflected light sensors
   iii) Slip sensor
   iv) Eddy current proximity sensors 14M