

Code No: 117HA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech IV Year I Semester Examinations, March - 2017****ROBOTICS****(Common to ME, AME)****Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

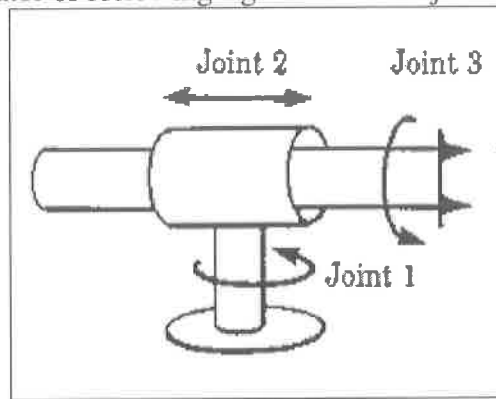
Part- A (25 Marks)

- 1.a) Define Degrees of Freedom. [2]
- b) What are the different types of control modes in a robot system? [3]
- c) What is joint coordinates? [2]
- d) What is the difference between forward and inverse kinematics? [3]
- e) Define manipulator. [2]
- f) Discuss about planar two link manipulators. [3]
- g) What is trajectory planning? [2]
- h) Explain about application of encoders. [3]
- i) Describe the role of robot in inspection. [2]
- j) Explain about robot cell layout design. [3]

Part-B (50 Marks)

- 2.a) What is Robotics? Explain the various components involved in Robotic System with block diagram.
 - b) Explain the classification of robots by different controlling methods. [5+5]
- OR**
- 3.a) With a neat sketch explain the magnetic gripper and List its advantages and limitations.
 - b) How the robot end effector interface is achieved. Explain. [5+5]
4. Find the rotation matrix for a rotation of 30° about the OZ axis followed by a rotation of 60° about OX axis, followed by a rotation of 90° about OY axis. [10]
- OR**
5. Derive the inverse kinematics of the 3-DOF manipulator by considering an example. [10]

6. Give that 3×3 jacobian which calculates linear velocity of the tool tip from the three joint rates for the manipulator of following figure. Give the jacobian in frame {0}. [10]



OR

7. Using Lagrange Euler formulations determine the equation of motion for the RP manipulator. [10]
8. What are the considerations that are made while planning a joint interpolated motion trajectory? Explain. [10]
- OR
9. Explain various feedback components used for robot operation. [10]
10. Explain the various applications of robot in manufacturing and explain how the robots are handling materials in a shop floor. [10]
- OR
11. Write a short note on following:
 a) Work volume
 b) General considerations of Robot in Material Handling. [5+5]

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