EIGHTH SEMESTER B.TECH. DEGREE EXAMINATION

2013 Scheme – Model Question Paper

13.801 ROBOTICS & INDUSTRIAL AUTOMATION (A)

Time: 3 Hours   Max Marks: 100

Part A

(Answer **all** questions.)

1. Explain the application scenario of each of the following manipulator configurations. (4)

    a) SCARA Manipulator.

    b) Articulated Manipulator.

2. Obtain the forward and reverse kinematics of a 3R planar Manipulator. (4)

3. Discuss MOTION commands used in robot programming. (4)

4. Explain the different steps in trajectory planning. (4)

5. Briefly explain various methods available for image segmentation based on colour. (4)

Part B

(Answer any one question from each module, 20 marks each)

Module-I

6. a) What are the different classifications of industrial manipulators based on geometric configuration? Also give the work envelope of each configuration. (12)

    b) Differentiate between Repeatability and Accuracy of a robotic manipulator. (4)

   c) Give any two application of robots in the field of medicine. (4)

OR

7. a) What are the basic elements of an Industrial Automation System.? (8)

    b) Explain the applications of robotic manipulator in industrial automation scenario. (6)

    c) With suitable diagrams explain Pitch, Yaw and Roll motions as concerned with a robotic manipulator. (6)

Module-II

8. Frame (2) is rotated with respect to frame (1) about the X-axis by an angle of $60°$. Also frame (2) is translated such that the position of the origin of frame (2) as seen from frame (1) is (9, 7, 5). Obtain the homogenous transformation matrix which describes frame (2) relative to frame (1). Also find the description of a point P in frame (1) if it is represented in frame(2) as (4,6,8). (20)

OR

9. Obtain the Homogenous Transformation matrix of the following robotic configuration using Denavit-Hartenberg method. (20)
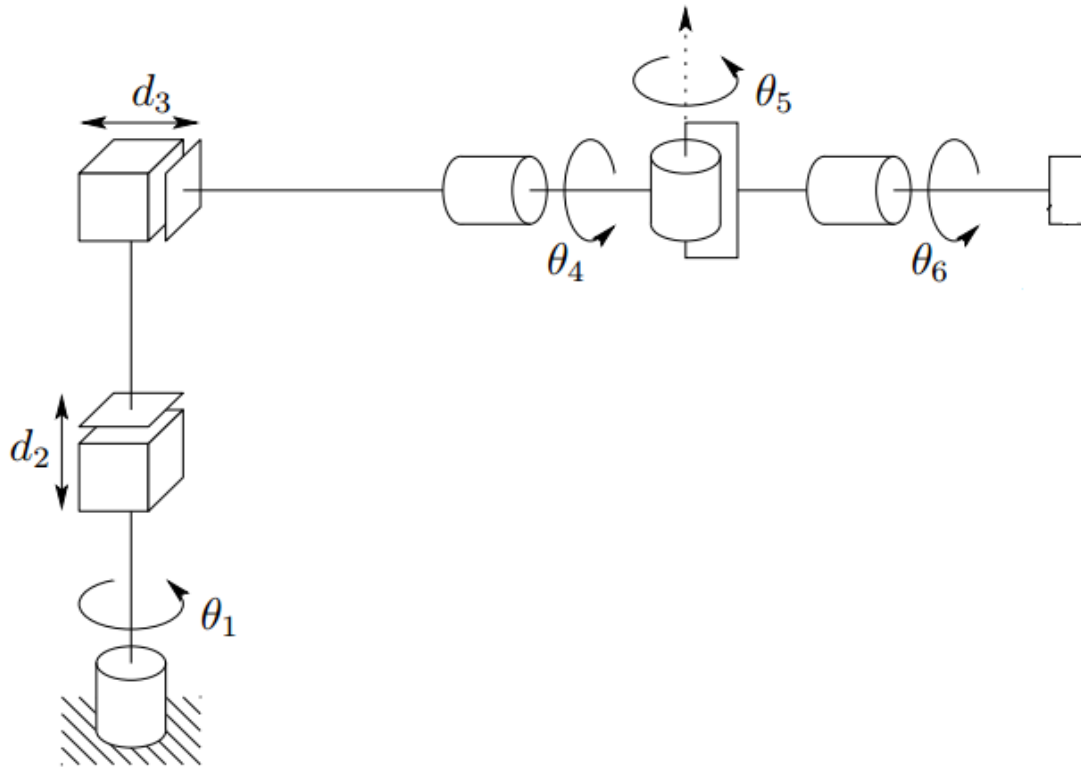
Module- III

10. What is a robot work cell? What are the different classifications of work cell layout? (20)

OR

11. a) Explain any four types of robot programming. Discuss the important requirements of programming languages. (12)

b) With a suitable example demonstrate the application of PLCs in Industrial Robot Control. (8)

Module-IV

12. a) Explain in detail the various software and hardware components of a Computer Integrated Manufacturing System? (14)

b) Give any five examples for data communication protocols used in industrial automation industry. Explain the necessity of adopting communication protocols in industrial automation. (6)

OR

13. a) Explain RGB, HSI and CMY models for colour image representation. (8)

b) Draw and explain HSI triangle. (6)

c) Derive expressions for RGB to HSI conversion of a colour image. (6)

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