Code: 13A10802 **R13**

B.Tech IV Year II Semester (R13) Advanced Supplementary Examinations July 2017

ROBOTICS

(Electronics & Instrumentation Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Specify the basic components in a robot.
(b) What is meant by tactile sensors? Give any two examples.
(c) What is the purpose of PID controller?
(d) Specify the functions of robotic controllers.
(e) What is meant by end-effectors?
(f) Specify the purpose to define the robotic motion path.
(g) Draw the kinematic diagram of a simple robotic arm and indicate the degrees-of-freedom, tool center point and coordinate frames.
(h) What are the parameters required to solve the inverse kinematic problem?
(i) What is the need for robots in industrial environment?
(j) List the parameters to be considered to use a robot in medical applications.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 With schematic diagrams, explain Cartesian, Cylindrical, Gantry, Spherical, SCARA and articulated configurations of robots and discuss their functional capabilities and applications.

OR

3 Explain the image data reduction and segmentation techniques, with examples and illustrations.

UNIT – II

4 With a block diagram, discuss the linear feedback system.

OR

5 Discuss the impedance control system with suitable application.

UNIT – III

6 Discuss the various types of grippers with neat schematic diagrams and explain the applications of each type in industrial scenario.

OR

7 Describe the motion path considering a typical pick and place operation of a robot and explain the strategy & constraints.

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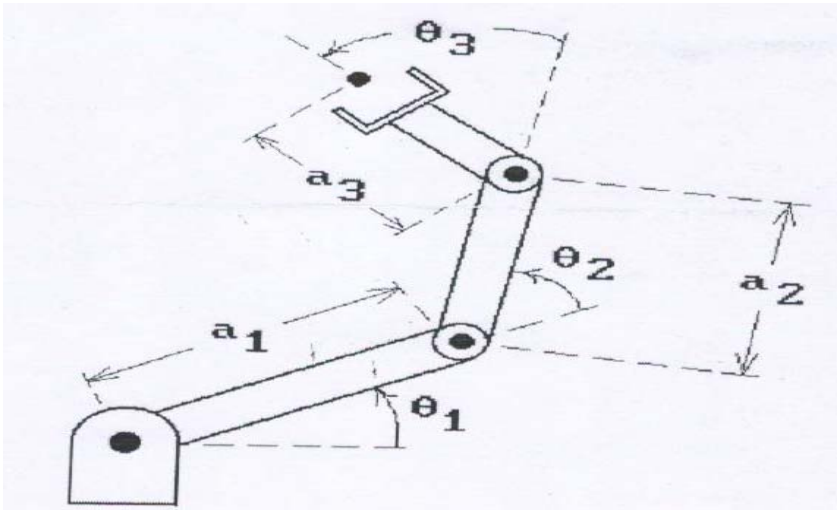
UNIT – IV

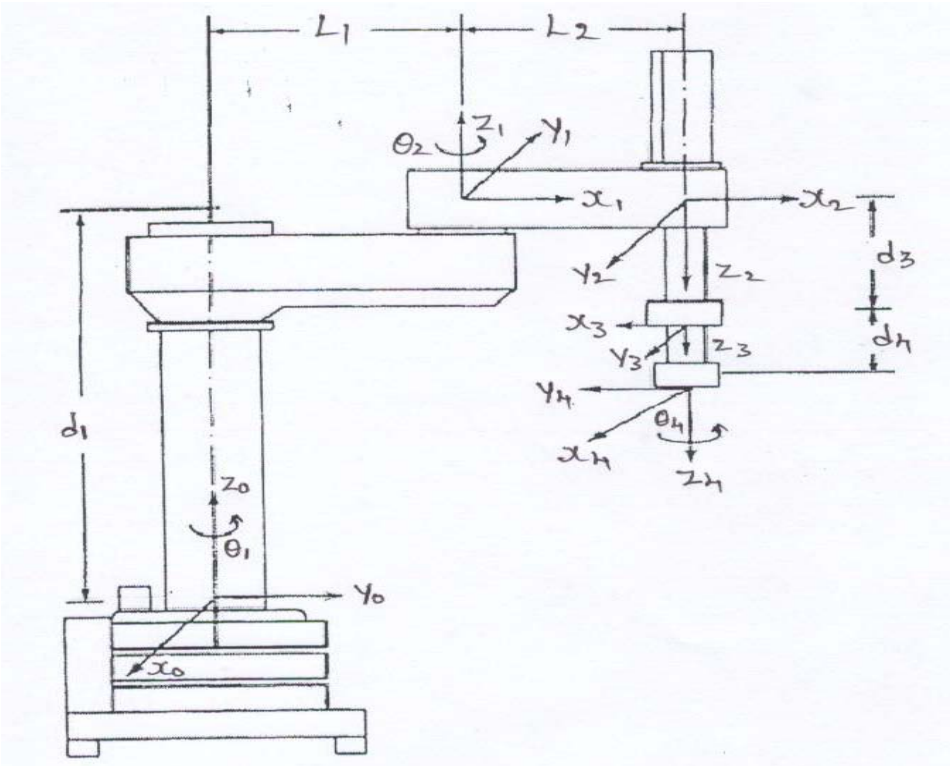
8 A simple 3 link articulated robotic configuration is given in figure below. Consider that length a_1 = 100 mm, a_2 = 80 mm, a_3 = 60 mm and θ_1 = 30°, θ_2 = 40°, θ_3 = 70°. Apply the homogeneous transformations and calculate the coordinates of TCP point. Draw this configuration on graph sheet and validate the result. Explain each step in the transformation with detailed diagram and transformation matrices.



Kinematic diagram of a 3-link articulated robot

OR

9 The following shows a typical configuration of an industrial robot in which links and joints parameters are given. Apply the forward kinematic principles and find the TCP point.



Links and joints parameters of a robot arm

UNIT – V

10 Discuss the classification of robots based on applications.

OR

11 Explain the role of remote control robots with examples and provide one case study.

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