Code No: 136FC **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, May - 2019
FUNDAMENTALS OF ROBOTICS
(Common to CE, EEE, ECE, CSE, AE)

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) What controlled systems are involved in a robotic industry. [2]
b) What are the different notation scheme in designing the robot configurations. [3]
c) How tools can be used as end effectors. [2]
d) How the linkage actuation determines the finger opening and closing activity. [3]
e) What is homogeneous transformation matrix? [2]
f) The x and y position of the end of the arm in world space by defining a for link 1 and another for link 2 of a 2 DOF arm in inverse transformation. [3]
g) How the interaction control is used to control the robot motions. [2]
h) Briefly explain the blending scheme in trajectory planning. [3]
i) What is the function of VAL in robot textual language? [2]
j) What is the meant by training the vision system. [3]

PART - B

(50 Marks)

2.a) Differentiate serial and parallel manipulator.
b) Explain the constructional features and range of any two proximity sensors. [5+5]

OR

3.a) How the correct accuracy, repeatability and resolution enhance the properties performed by a robot.
b) Explain the principle for potentiometer and encoder as position sensors. [5+5]

4.a) What is physical constriction method of finger design.
b) State the principle adopted in vacuum cup gripper and its applications. [5+5]

OR

5.a) Analyze the gripper force to be used in various linkage mechanisms.
b) How the grippers are selected based on the applications. [5+5]

6.a) What are the three basic rules on the basis of which DH matrix is established.
b) Determine the rotation matrix that represents a rotation of 60^0 about OZ axis, followed by rotation of 30^0 about OY axis, followed by rotation of 45^0 about OX axis. [5+5]

OR

7. Express the inverse transform technique for Euler angles solution upto inconsistent solution. [10]

8. Formulate joint trajectories in 5 cubic trajectory segments with time varying from 0 to 1 units with appropriate cubic spline functions. [10]

OR

9.a) Explain the cubic polynomial fit via point for a smooth trajectory.

b) How the servo system is established for robotic control. [5+5]

10.a) Describe the various parameters considered in image data reduction and feature extraction in machine vision.

b) Explain how the end effector and sensor commands are executed? [5+5]

OR

11.a) How the robot language is structured?

b) What are the various motion commands used for robot's movement? [5+5]

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