Total number of printed pages–4

53 (CS 812) RBT

2021

ROBOTICS

Paper : CS 812

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* What are the two sections of the robot manipulator and also mention the role of joints and links in the manipulator ?

   (b) Mention the polar coordinate and cylindrical body and arm assembly notations with diagrams, and sketch the following manipulator configuration,

   (i) TRT : R

   (ii) TVR : TR

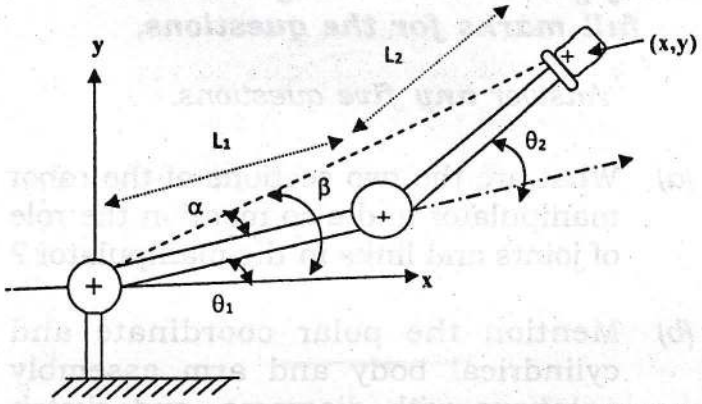
   (iii) RR : T

Contd.

(c) What are the three kinds of joint drive systems? 4+12+4=20

2. (a) Describe 2 dimensional 2-DOF robot manipulator (R-R) and also define the position of end arm in the world space (Forward transformation) using the vector of links L_1 and L_2.

(b) Calculate the reverse transformation (θ_1 and θ_2) from the figure given below:



10+10=20

3. (a) Given a vector, $V = 40i + 15j + 20k$, perform a translation by a distance of 8, 6, 4 in 'x', 'y', 'z' directions respectively. Calculate the translation vector after this transformation'.

(b) Given a vector, $V = 30i + 10j + 20k$, rotate by an angle of 90° about the y-axis. Derive the rotation transformation. 10+10=20

4. (a) Explain the attributes of sensor? 8

(b) Define the sensor fusion and the cosequences of false positive, false negative and Redundant. 6

(c) Define the Competing, Complementary, Coordinated sensors and sensor fission with a diagram. 6

5. Write down the short notes on the following : ***(any four)*** 5×4=20

(i) Sampling and Quantization

(ii) Logical Sensor

(iii) Industrial Robotics

(iv) GEONS

(v) GDP description of a bolt.

6. Differentiate between the following : ***(any four)*** 5×4=20

(i) Powered leadthrough *vs* Manual leadthrough

(ii) Revolute Joints *vs* Prismatics Joints

(iii) Link parameter and Joint parameter

(iv) Action oriented sensor fusion and sensor Fashion

(v) Proprioception *vs* Exteroception.