



**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION – JAN 2023

Course Code: MEC 3065

Course Name: Introduction to Robotics and Automation

Program : B. Tech

Date: 30-JAN-2023

Time: 09:30AM – 12:30PM

Max Marks: 100

Weightage: 50%

Instructions:

(i) Read the all questions carefully and answer accordingly.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries SIX marks.

(5Qx 6M= 30M)

1 Explain control resolution and accuracy attributes regarding a robot.

(C.O.No.1) [Knowledge level]

2 What is Manipulator. Briefly explain classification of Manipulator. (C.O.No.2) [Knowledge level]

3 Compile a list of sensors that might be used in robotics systems. For Each Sensor, Give an application. (C.O.No.4) [Knowledge level]

4 What do you think of future of robots? (C.O.No.4) [Knowledge level]

5 Using the D-H notation for frame assignment, is it possible to have a link with zero link length
Where as the physical link on the manipulator will have a finite link length?

(C.O.No.3) [Knowledge level]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.

(3Qx10M=30M)

6 What are the physical characteristics required for determining a work volume. Also give work volume for all types of configuration robot with neat sketch diagram.

(C.O.No.1) [Comprehension level]

7 A single cubic trajectory given by $q(t) = 50 + t^2 - 6t^3$ is used for a period of 3 seconds.

Determine starting goal position, Velocity, and accelerations of the end-effector.

(C.O.No.3) [Application level]

8 Define actuators. Also explain general features of hydraulic, pneumatic and electric

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TWENTY marks.

(2Qx20M=40M)

- 9 Two joints of a SCARA manipulator are to move by 45° and 60° in 2 seconds and 3 seconds, respectively. Assuming the trajectory to be cubic for both the joints, determine the coefficients a_{ij} for the two cubic polynomials:

$$\theta_1(t) = a_{10} + a_{11}t + a_{12}t^2 + a_{13}t^3$$

$$\theta_2(t) = a_{20} + a_{21}t + a_{22}t^2 + a_{23}t^3$$

Will the trajectories for the two joints be different if the joints are considered at some location other than 0° at the start point ?

(C.O.No.3) [Application level]

- 10 Determine the D-H Parameter Table for following Robot.

(C.O.No.3) [Application level]

