PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023

Semester : Semester III - 2021   **Date :** 9-JAN-2023
Course Code : MEC3065   **Time :** 1.00PM - 4.00PM
Course Name : Sem III - MEC3065 - Introduction to Robotics and Automation   **Max Marks :** 100
Program : B.Tech. Information Science & Engineering (AI and Robotics)   **Weightage :** 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.

PART A

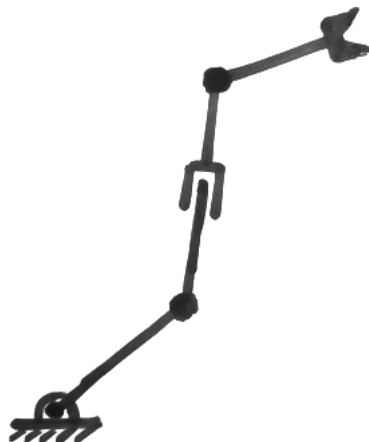**ANSWER ALL THE TEN QUESTIONS**   **10 X 2 = 20M**

1. Write down the classification of manipulator based on drive system.

                                                                                (CO1) [Knowledge]

2. Classify the grippers.

                                                                                (CO1) [Knowledge]

3. Write down any four selection criteria for a robot.

                                                                                (CO1) [Knowledge]

4. Determine the DOF for Following Robot?

                                                                                (CO2) [Knowledge]

5. Where is end-effector connected to the manipulator?

(CO2) [Knowledge]

6. Define the following.
   a. Load Carrying capacity
   b. Work volume

(CO2) [Knowledge]

7. Write down a general fifth-order polynomial trajectory with its coefficient.

(CO3) [Knowledge]

8. Briefly explain Hydraulic system.

(CO4) [Knowledge]

9. Write down any four advantages and disadvantages of electric actuators.

(CO4) [Knowledge]

10. Write any four advantages and disadvantages of Pneumatic actuators.

(CO4) [Knowledge]
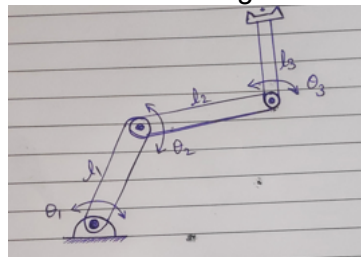

PART B

ANSWER ALL THE FIVE QUESTIONS   5 X 10 = 50M

11. Determine final Transformation matrix for the following D-H Table.

Link/Frame	α_{i-1}	a_{i-1}	d_i	Θ_i
1	$\dfrac{\Pi}{2}$	L_1	0	Θ_1
2	0	L_2	0	Θ_2
3	0	L_3	0	Θ_3

(CO2) [Comprehension]

12. Determine the D-H parameter table after assignment of frames for the following structure.

(CO2) [Comprehension]

13. Assume a robot joint has to move from 0 degree to 90 degree in 4 seconds. The initial and final joint are respectively 10 degree/sec and -10 degree/sec. In the intermediate point of 45 degree at the time t = 2sec, the joint rate is assumed to be -4 degree /sec. Determine the two cubic trajectories using mentioned conditions.

(CO3) [Comprehension]

14. A rotary joint moves from 0 degree to 30 degree in 2 seconds. Determine a smooth polynomial trajectory if the initial and final velocities and accelerations are zero. What is the order of the polynomial?

(CO3) [Comprehension]

15. Differentiate among electric, hydraulic and pneumatic actuators.

(CO4) [Comprehension]

ANSWER ALL THE TWO QUESTIONS   **2 X 15 = 30M**

16. A single linked robot with roatary joint is motionless at initial angular position 15 degree. It is decided to move in a smooth manner at final angular position 75 degree in 3 seconds. Construct a cubic trajectory polynomial and plot the time history plot of displacment, velocity, acceleration with respect to time.

(CO3) [Application]

17. Write down all possible classification of robots.?

(CO2) [Application]

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