Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 09-10-2025 **Time:** 09.30am to 11.00am

School: SOE	**Program:** B. Tech	
Course Code: MEC3060	**Course Name**: Robotics	
Semester: V	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	16	12	22	-	-

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

1	Write the classification of robot based on configuration.	**2 Marks**	**L2**	**CO1**
2	Define workspace and write 2 types of workspace.	**2 Marks**	**L2**	**CO1**
3	Explain degree of Mobility in robotics briefly.	**2 Marks**	**L2**	**CO2**
4	Define Jacobians used in analysis of position of robots.	**2 Marks**	**L2**	**CO3**
5	Write different types of locomotion.	**2 Marks**	**L2**	**CO1**

Part B

Answer the Questions. **Total Marks 40M**

6.		Derive the forward kinematics for 2 DOF serial manipulator.	**10 Marks**	**L3**	**CO1**
		Or			
7.		Define degree of maneuverability and Determine the degree of maneuverability for 2 wheeled autonomous mobile robot, differential drive robot and 4-wheeled mecanum wheeled mobile robot.	**10 Marks**	**L3**	**CO1**

8.		The inverse kinematics of robots play an important role in design of algorithms for their orientation. The final position of the end effector is to be kept at (x, y) = (20 cm, 27 cm). If link 1 and link 2 are of 32 cm and 45 cm respectively. Find the angular orientations of link 1 and link 2.	**10 Marks**	**L3**	**CO2**
		Or			
9.		Find the angular orientations of link 1 and link 2 if final position of the end effector is to be at (x, y) = (26 cm, 32 cm). If link 1 and link 2 are of 33 cm and 44 cm respectively.	**10 Marks**	**L3**	**CO2**

10.		A frame {B} is rotated about Y axis of the universal coordinate system by 30 degrees and translated along X, Y and Z by 2, 1, and 2 units, respectively. Let the position of a point Q in {B} is given by $[1.0\ 2.0\ 3.0]^T$ Calculate the final position with respect to universal coordinate system.	**10 Marks**	**L3**	**CO3**
		Or			
11.		A frame {B} is rotated about X axis of the universal coordinate system by 45 degrees and translated along X, Y and Z by 1, 2, and 3 units, respectively. Let the position of a point Q in {B} is given by $[3.0\ 2.0\ 1.0]^T$. Determine position with respect to universal coordinate system.	**10 Marks**	**L3**	**CO3**

12.		Explain the role of Jacobians in robotics. Also explain the kinematics structure of Jacobian for position and velocity mapping in robotics.	**10 Marks**	**L3**	**CO3**
		Or			
13.		Explain the role of various velocity components in Jacobians of robots. Also explain the static forces in robotic manipulators.	**10 Marks**	**L3**	**CO3**