

Enroll No

Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to SUK)

Q.P. Code
UT 3209

Unit Test -II (2025-26)

T.Y. B.Tech.- Robotics & Automation

Course Code: RAMD301**Course Name: MDM-III Kinematic & Dynamics for Robots**

Day & Date: Monday 22.09.2025

Time: 10.30-11.30 AM

Max Marks-25

Instructions: 1) All questions are compulsory.

2) Figures in rounded () brackets within the question, indicate the scheme of marking for respective part of the question, whereas figures in the first right column indicate total marks for that whole question.

3) CO is the index number of the Course Outcome statement.

4) The Bloom's taxonomy level (BL) for 1,2,3,4,5 and 6 is remember, understand, apply, analyze, evaluate and create respectively.

5) Assume suitable data if necessary.

6) Use of non-programmable calculators is allowed

			Marks	BL	CO
Q.1	A	Discuss the types of robot end-effectors (mechanical, vacuum, magnetic, adhesive, tool-type) with suitable examples (3). Explain the drive systems used in grippers (hydraulic, pneumatic, electric, mechanical) with some examples. (3).	6	3	4
	B	Explain Robot Kinematics and its types (forward and inverse) (2). With neat sketches, illustrate all axis rotational coordinate systems (X, Y, Z) (2). Further, explain the concept of homogeneous coordinates and derive the homogeneous transformation matrix with a suitable diagram (3)	7	4	2
		OR			
	C	A 2-link planar robotic manipulator has: Link lengths: $L_1=0.5\text{m}$, $L_2=0.4\text{m}$. Use the Denavit-Hartenberg (DH) convention. calculate the end-effector position (x,y) for $\theta_1 = 0.7854\text{ rad}$, $\theta_2 = 0.5236\text{ rad}$.	7	4	2



Q.2 A Derive the expressions for joint angles w.r.t to the inverse kinematics for a 2-link planar manipulator. 6 4 2

OR

B A 2-link planar robotic manipulator has: Link lengths: $L_1=15\text{cm}$, $L_2=10\text{cm}$. Use inverse kinematics to calculate the joint angles. Given end effector values are $dx= 12.1598\text{cm}$, $dy= 16.4567\text{cm}$ 6 4 2

C A rigid body undergoes a composite transformation: rotation about Z-axis by 90° followed by translation along X-axis by 5 units. Construct the homogeneous transformation matrix. 6 4 2

