

Name: _____ Imza: _____

Assignment Submission deadline: Monday 03 November 11:00

Quiz - I

TAKE HOME

MECE 574 Industrial Automation and Robotics Technology

Fall 2025

Q1: For Euler angles with rotation sequence X-Z-Y, where

- Roll ϕ is about X-axis
 - Yaw ψ is about Z-axis
 - Pitch θ is about Y-axis
1. Build a generic rotation matrix for
 - a. The extrinsic (axis fixed in space) rotations
 - b. The intrinsic (rotations about the body's moving axis) rotations
 2. Evaluate both composite rotation matrices for $(\phi, \psi, \theta) = \left(\frac{\pi}{4}, \frac{\pi}{2}, \frac{\pi}{2}\right)$.
 3. Compare the results for both extrinsic and intrinsic rotation matrices.

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Q2: Calculate the forward kinematics of the 3-link robot manipulator. Draw link-coordinate diagram. Determine all kinematics parameters of the DH Table. Determine arm matrix from base-tool.

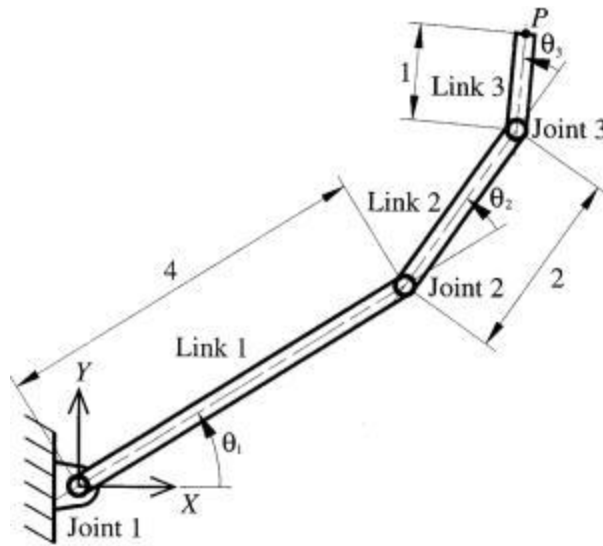


Figure 1: 3-link robot manipulator

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Q3: Determine joint angles for the 3-link robot manipulator shown in Figure 1 using Inverse Kinematics. Utilize both **analytical** and **geometric** approaches to perform IK operation.

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