

Assignment 2

MECE 574 Industrial Automation and Robotics Technology

Fall 2025

Department of Mechatronics Engineering

Atilim University

Assignment submission deadline: 09:30hrs, Thursday 18 Dec 2025

Note: Assignment must be submitted by hand.

Q 1: Calculate the ${}^T_6 J_{21}$ element of the Jacobian matrix for the articulated robot shown in Figure 1.

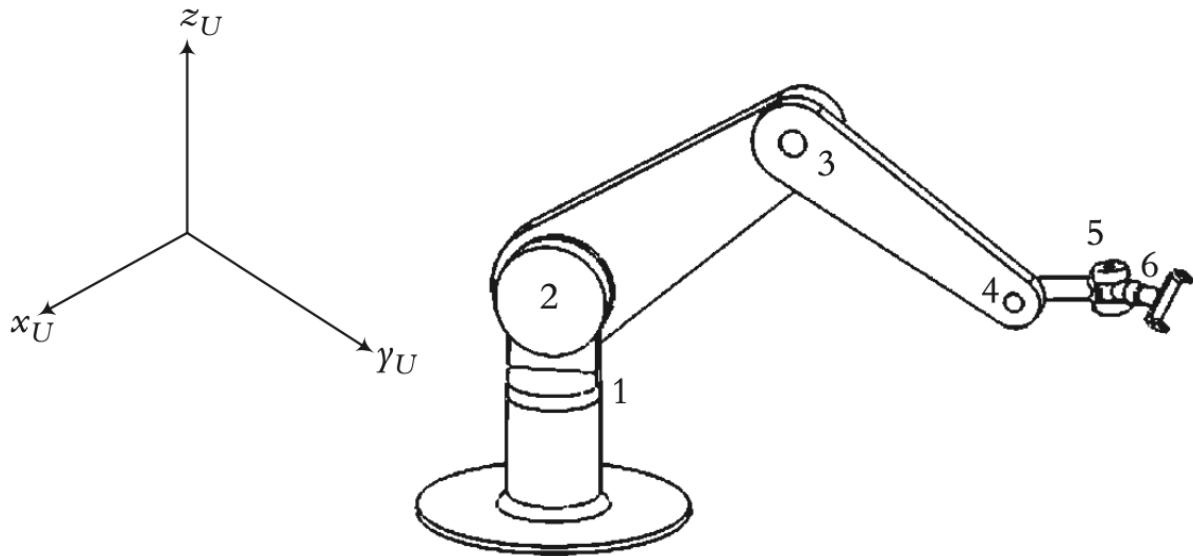


Figure 1: six-dof articulated robot

Q 2: Write the equation of motion for a 3-dof revolute robot using the method of your choice.

Q 3: It is desired to have the third joint of a 6-axis robot go from an initial angle of 20 deg to a final angle of 80 deg in 4 seconds. Calculate the coefficients for a third-order polynomial joint-space trajectory and plot the joint angles, velocities, and accelerations. The robot starts from rest but should have a final velocity of 5 deg/sec.

Q 4: Joint 1 of a 6-axis robot is to go from an initial angle of 30 deg to the final angle of 120 deg in 4 seconds with a cruising velocity of 30 deg/sec. Find the necessary blending time for a trajectory with linear segments and parabolic blends and plot the joint positions, velocities, and accelerations.