

## **Abstract**

This project presents the forward and inverse kinematic analysis and verification, workspace determination, singularities, dynamic analysis, and control of a 6-DOF serial robot. The robot under study is the 6-DOF RS013N robot designed and manufactured by Kawasaki Robotics, Inc. The analysis of the mentioned robot is done by determining the necessary characteristics to extract the direct kinematics of the robot based on Denavit-Hartenberg parameters. Then, the inverse kinematics of the robot is investigated analytically. After studying the kinematics of the robot, the Jacobian matrix and its singularities are analyzed. All equations are verified using the Peter Corke simulation environment and different derivation methods. Dynamic equations are derived using Newton-Euler and Lagrange methods. Afterward, control of the robot will be implemented on the kinematic and dynamic models. PD and PDG controllers are implemented on different trajectories, and results are represented.

**Key Words - 6-DOF Serial Robot, Kinematic analysis, Dynamic Analysis, PDG Controller**