University Institute of Engineering

Department of Electronics & Communication Engineering

Experiment No. 6

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Branch: Electronics and Communication **Section/Group: A**
Semester: 7th **Date of Performance:25/09/2023**
Subject Name: Industrial Automation & Robotics **Code: 20ECA-446**

1. Aim of the practical: To design a robot which drive through dynamics in MATLAB Simulink.

2. Tool Used: MATLAB Simulink.

3. Theory:

A robot that operates based on dynamics theory is one that moves and interacts with its surroundings in accordance with the fundamental principles of physics. This implies that the robot's motion is influenced by various forces like gravity, friction, and the forces generated by its actuators.

Dynamics theory, rooted in physics, is a field dedicated to studying the motion of objects under the impact of forces. It finds practical application in the design and control of diverse systems, with robots being one notable example.

Designing a robot employing dynamics theory can be approached in several ways. A prevalent method is the model-based approach, where a mathematical model of the robot is formulated. This model is then utilized to create a controller that guides the robot toward the desired state, taking into account the physical forces acting on it.

An alternative approach involves a learning-based methodology. In this scenario, the robot acquires the ability to move through interaction with its environment. The learning process involves the robot being positively reinforced for moving in the desired manner and penalized for undesired movements.

These approaches showcase the diverse strategies employed to create robots that navigate and interact with the world in a manner consistent with the principles of dynamics theory, offering flexibility and adaptability in various applications.

4. Steps for experiment:

- Create a kinematic model of the robot. This can be done using the Rigid Body Tree object in MATLAB Robotics System Toolbox.
- Create a dynamic model of the robot. This can be done using the Inverse Dynamics object in MATLAB Robotics System Toolbox.

- Create a controller for the robot. This can be done using any of the control blocks in Simulink.
- Connect the kinematic model, dynamic model, and controller together.
- Simulate the model.

5. Program Screenshots:

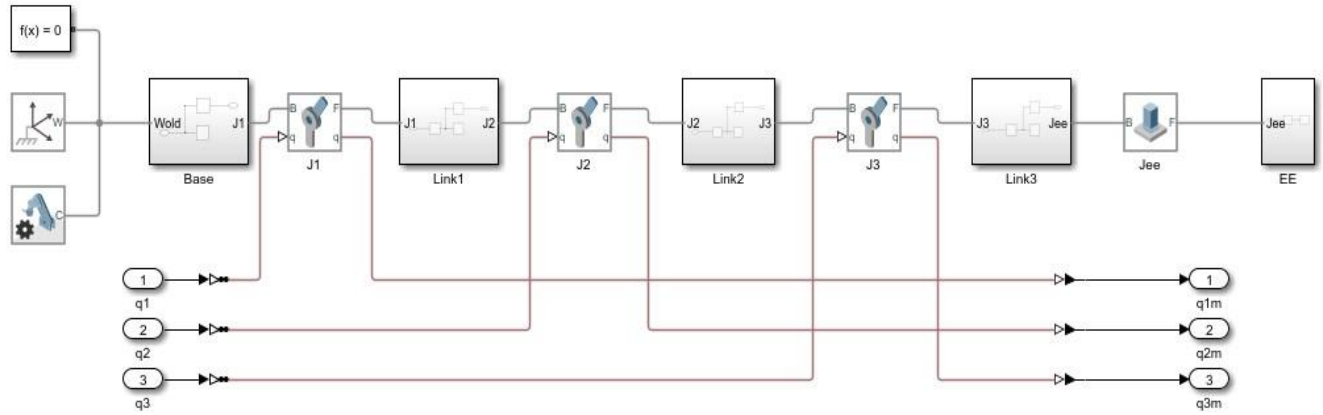

Figure: -6.1 Sub-Systems of Robo

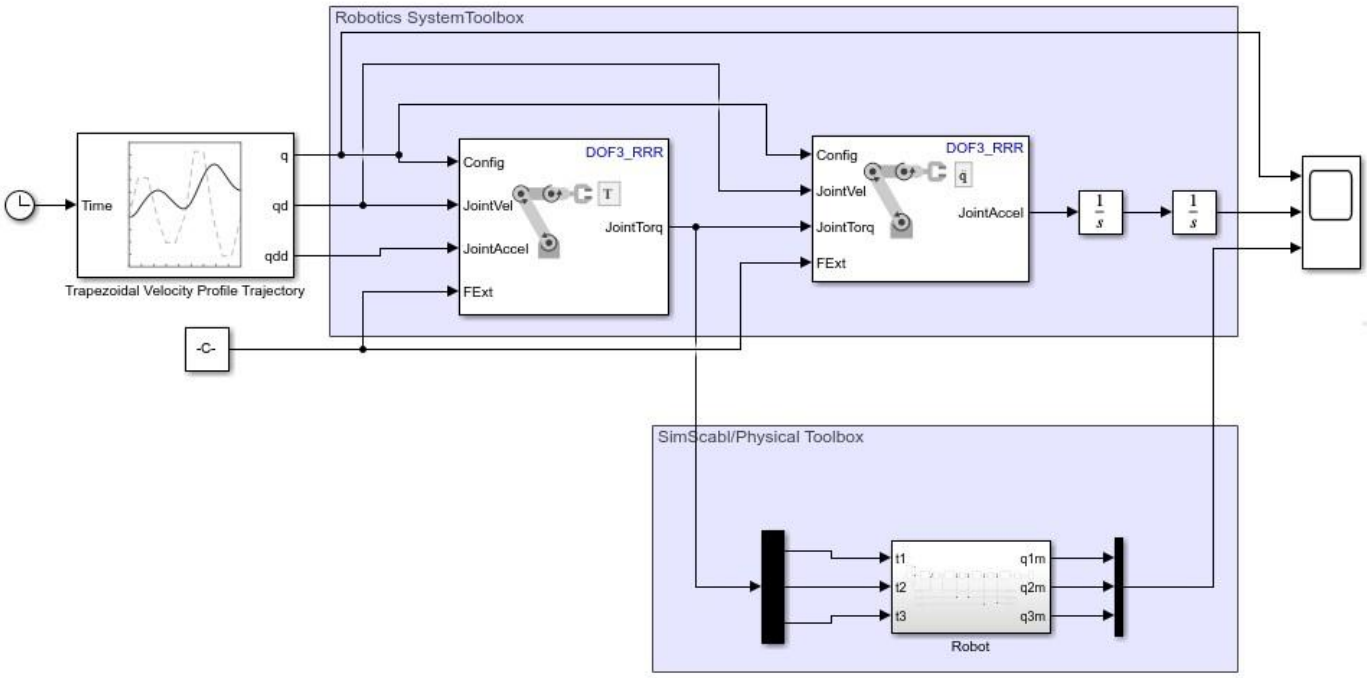

Figure 6.2 Giving signal through signal editor to system

Observations, Simulation/Output Screen Shots and Discussions:

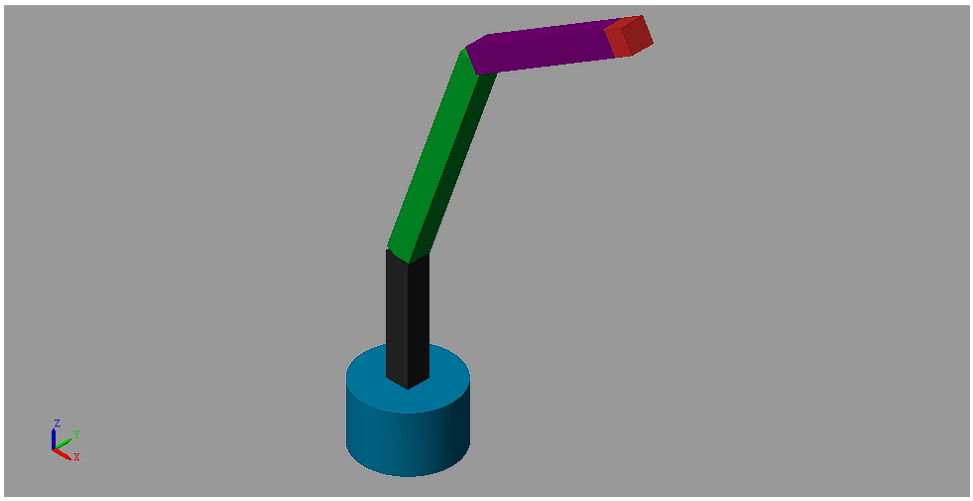

Figure 6.4: - Mechanics Explorer Window result

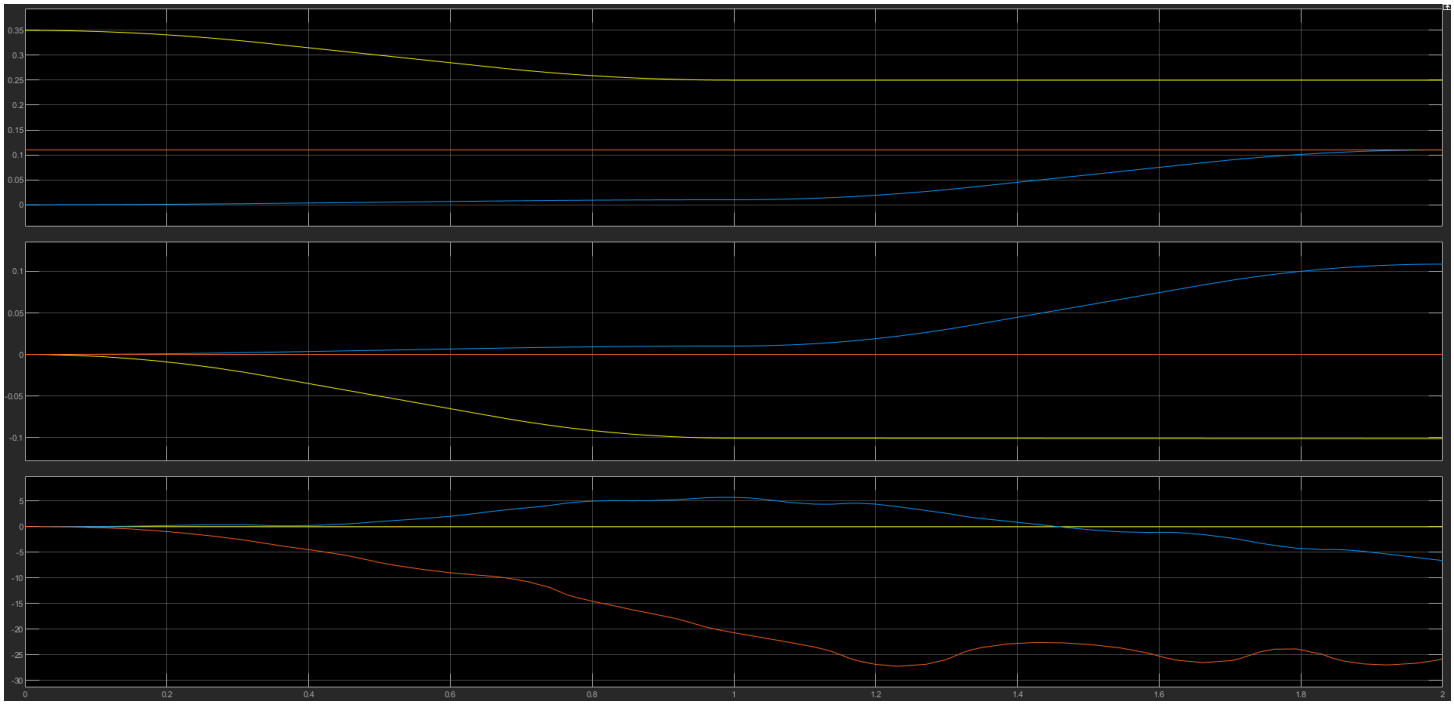

Figure 6.5: - Scope Graph of movement

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6. Additional Creative Inputs (If Any):

Learning outcomes (What I have learnt):

1. Learn to simulate on Simulink.
2. Learnt to use different functions of Simulink Library.
3. Learnt to drive robot through dynamics.

Evaluation Grid (To be filled by Faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.	Worksheet completion including writing learning objectives/Outcomes. (To be submitted at the end of the day)		10
2.	Viva Result		8
3.	Student Engagement in Simulation/Demonstration/Performance and Controls		12
	Signature of Faculty (with Date):	**Total Marks Obtained:**	