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Lab Assignment 4

Date: 04-10-2021

**Control Theory Lab 4 dated 04-10-2021.**

**Python Code:**

import control

import numpy as np

import matplotlib.pyplot as plt

import math

R = 240

L = 40

C = 1

Wn = 5

zeta = 0.6

B0 = Wn\*Wn

A0 = Wn\*Wn

A1 = 2\*zeta\*Wn

A2 = 1

den = np.array((A2,A1,A0))

num = np.array((B0))

H = control.tf(num, den)

print("H(s) = ", H)

t = np.arange(0,5,0.1)

T4, yout4 = control.step\_response(H, t, X0=0)

plt.plot(T4, yout4)

plt.xlabel("Time in sec")

plt.ylabel("Vout(t)")

plt.title("Step Response of RLC system")

plt.show()

M = 77.44

k = 296.67

B = 180.855

Wn = math.sqrt(k/M)

zeta = 0.596

B0 = Wn\*Wn

A0 = 1

A1 = 2\*zeta\*Wn

A2 = Wn\*Wn

den = np.array((A2,A1,A0))

num = np.array((B0))

H = control.tf(num, den)

print("H(s) - ", H)

t = np.arange(0,5,0.1)

T4, yout4 = control.step\_response(H, t, X0=0)

plt.plot(T4, yout4)

plt.xlabel("Time in sec")

plt.ylabel("Vout(t)")

plt.title("Step Response of Mechanical system")

plt.show()

H(s) =

25

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s^2 + 6 s + 25

Chart

Description automatically generated

H(s) -

3.831

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3.831 s^2 + 2.333 s + 1

Chart, line chart

Description automatically generated

**Learning outcomes:**

1. Using Control Library in Python
2. Finding step response of a system in python
3. Modelling a system based on physical parameters

**Conclusion:**

The first graph helps us to know how a plot zero graph is plotted with the given transfer function of a mechanical system and helps in easy visualization. In this, we have also learned to plot the step response of the mechanical system using coding. The second graph helps us to know how a plot zero graph is plotted with the given transfer function of a mechanical system and helps in easy visualization. In this, we have also learned to plot the step response of the mechanical system using coding.