Kathmandu University

Department of Computer Science and Engineering

Dhulikhel, Kavrepalanchowk

A Lab Report

on

"Control System"

Lab No: I & II

[Code No: COEG304**]**

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Title: To learn to use MATLAB Models and SIMULINK

Theory:

Mathematical models are extremely important to understand the behaviour of system to be controlled, MATLAB serves as an excellent software tool to develop and analyze these models.

Task 1: Step Input Response

Editor - C:\Users\LOQ\Documents\MATLAB\CE_55_4.m

CE_55_2.m | CE_55_3.m | CE_55_4.m | CE_55_1.m

```
%Lab-1: Mathematical modeling of a simple mass spring damper system
s=tf('s');
M=100; %kg
fv=300; %Nm
K=50; %N/m
F=100; %N

G=1/(M*s^2+fv*s+K);
step (G) ; %The default step input is of 1 amplitude
%xlabel ('Time (s)') ;
ylabel('Displacement(m)');

%Suppose I want to change the step input amplitude to F
opt = stepDataOptions('InputOffset',0,'StepAmplitude',F);
step (G, opt) ;
hold on; %command to make the graph wait to plot a new one in it
grid;
%To calculate the impact of another force too
opt = stepDataOptions('InputOffset',0,'StepAmplitude',110);
step(G,opt);
```

Figure 1: Step Input Response Code

This model represented a standard second-order system using a transfer function block. It was tested with a step input to observe time-domain characteristics such as rise time, overshoot, and settling behavior. This helped us understand how a second-order system responds to a sudden and sustained input.

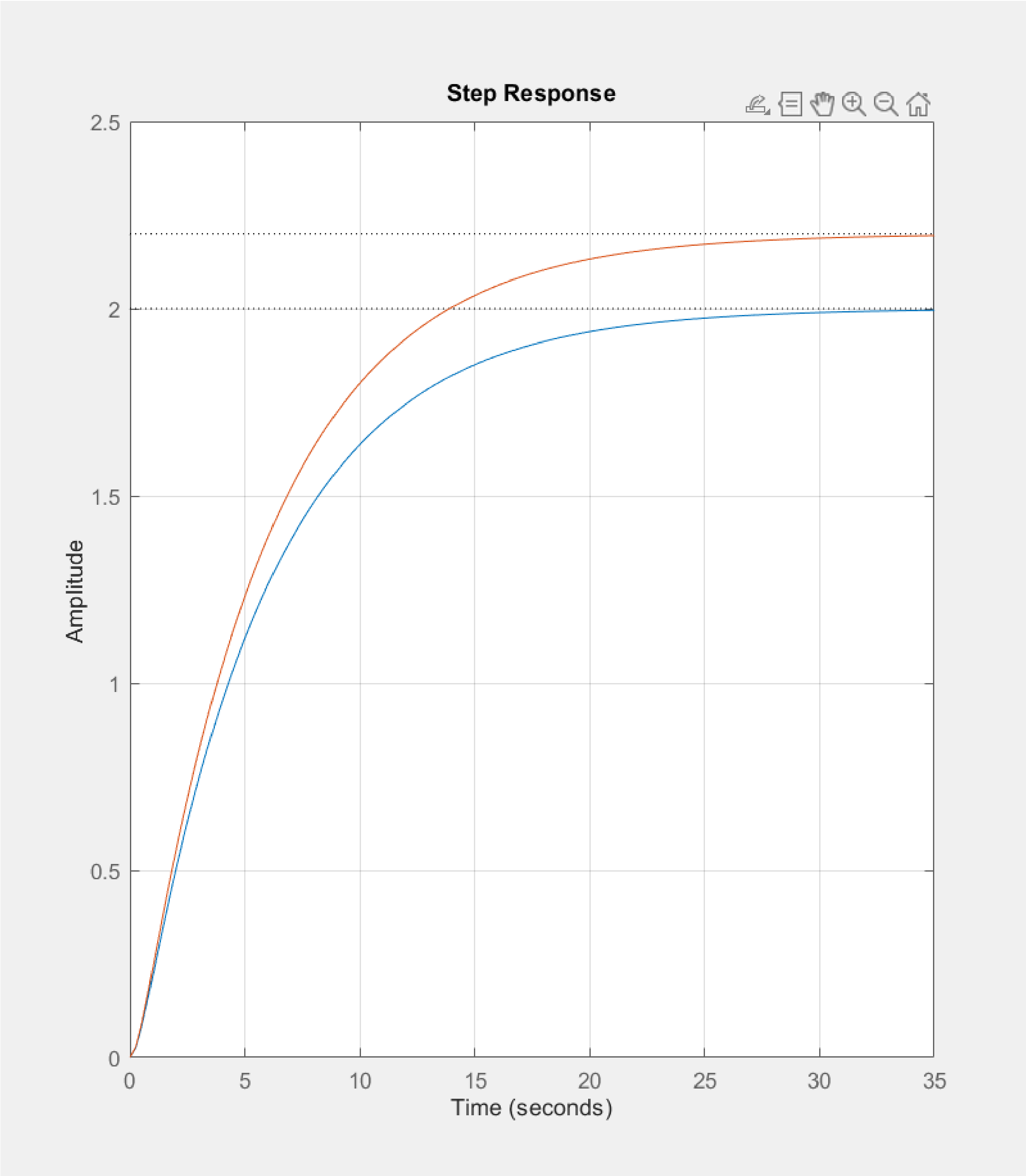

Figure 2: Step Input Response Output

Task 2: SIMULINK Execution

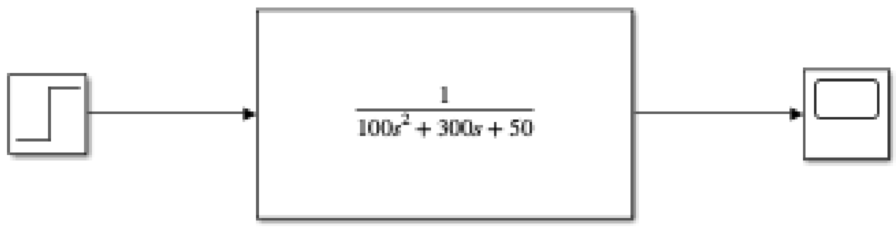

Figure 3: SIMULINK model

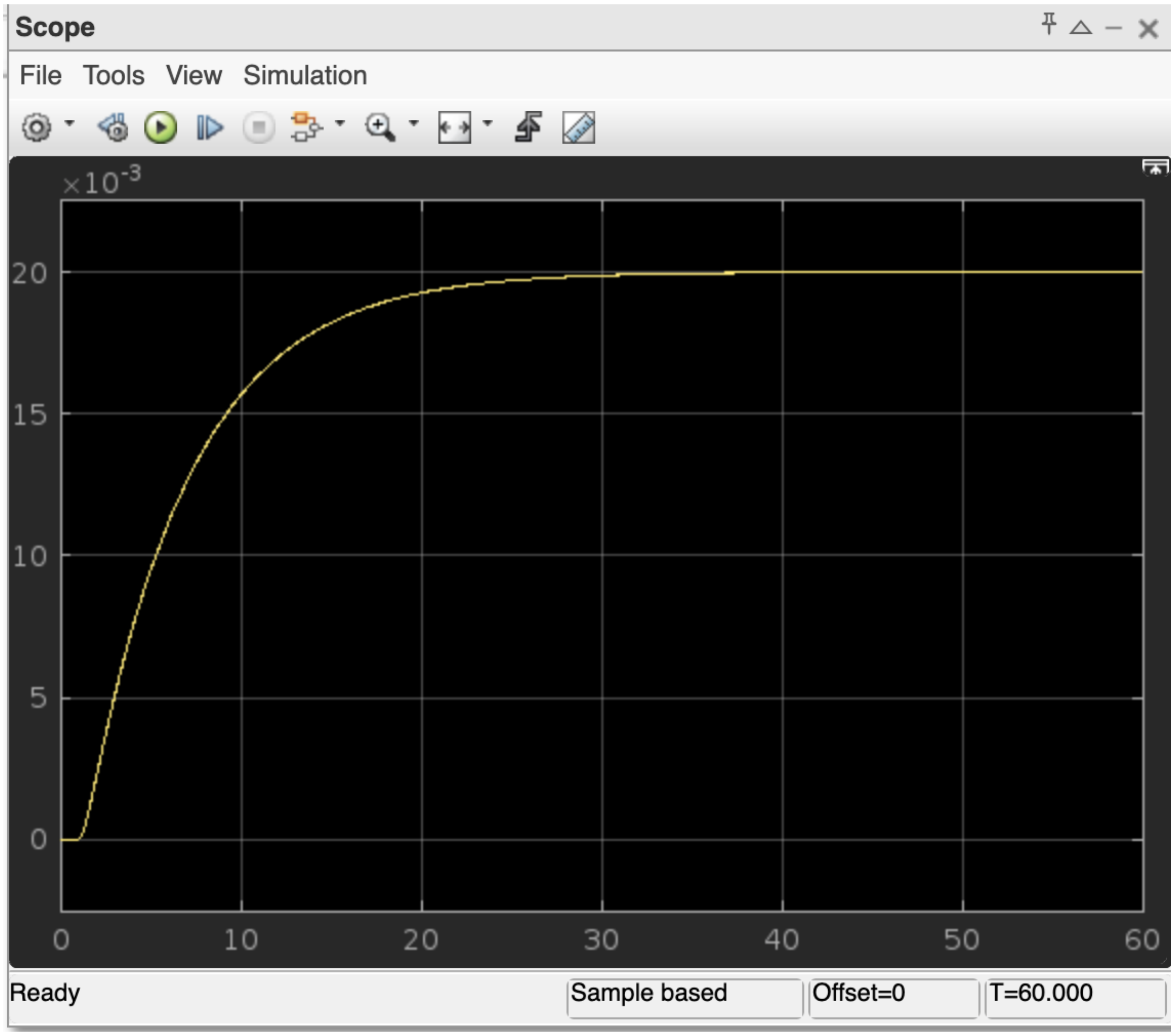

Figure 4: SIMULINK response

The second model used the same second-order system but with an **impulse input**, simulated using a short, high-amplitude pulse. This input represents a brief disturbance, allowing us to observe the system's **natural response** without continuous forcing. The output revealed key properties like damping and oscillation, helping us understand how the system reacts and stabilizes after a sudden shock.

Conclusion

This experiment helped us understand the dynamic behavior of control systems by modeling and simulating their responses in Simulink. Through step and impulse tests, we observed how parameters like damping and natural frequency influence system performance. The use of Simulink helped us to understand theoretical concepts and highlighted the value of simulation in control system analysis.