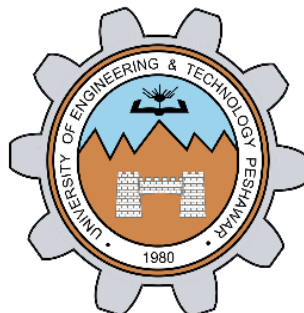


Lab # 12
SYSTEM DESIGN USING SISOTOOL



Fall 2024
CSE-310L
Control Systems Lab

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Section: C

“On my honor, as the students of the University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work.”

Students Signature: Didar Ali

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Lab # 12: System Design using Sisotool

Introduction

Percent overshoot:

Systems may be stable system, unstable system and marginally stable system. A stable system may overshoot for some values at the start before coming to the stable level. Similarly in this lab a system is designed whose percent overshoot is < 50 .

Damping ratio:

Damping ratio is a parameter that indicates that whether system is over damped ($\zeta > 1$), under damped ($\zeta = 0.2$).

Stable system:

Third condition which the system must satisfy is it must be stable for $K=2$.

Task

For $K < 2$, design a system (second order) with the following characteristics:

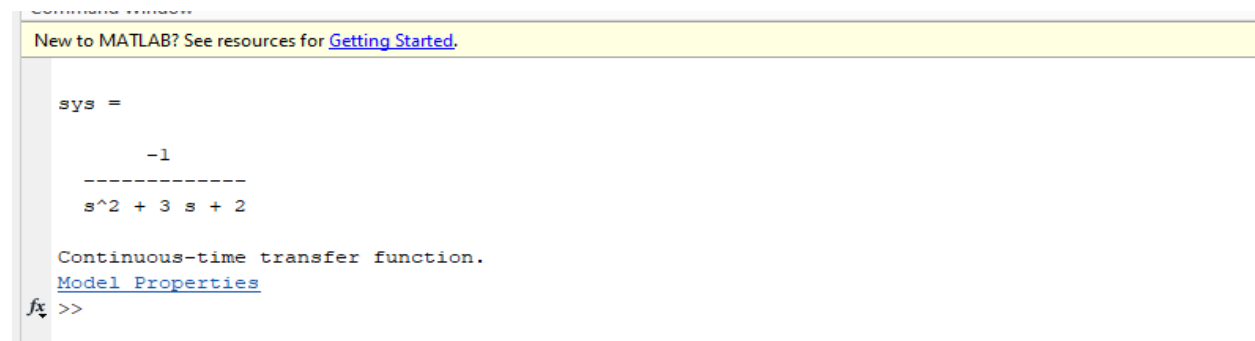
- Percent overshoot < 50
- Damping ratio > 0.2
- Stable system

Code:

```
clear all; clc; close all
```

```
num=[0 0 -1];
den=[1 3 2];
sys = tf(num,den)
sisotool(sys)
```

Output:



```

New to MATLAB? See resources for Getting Started.

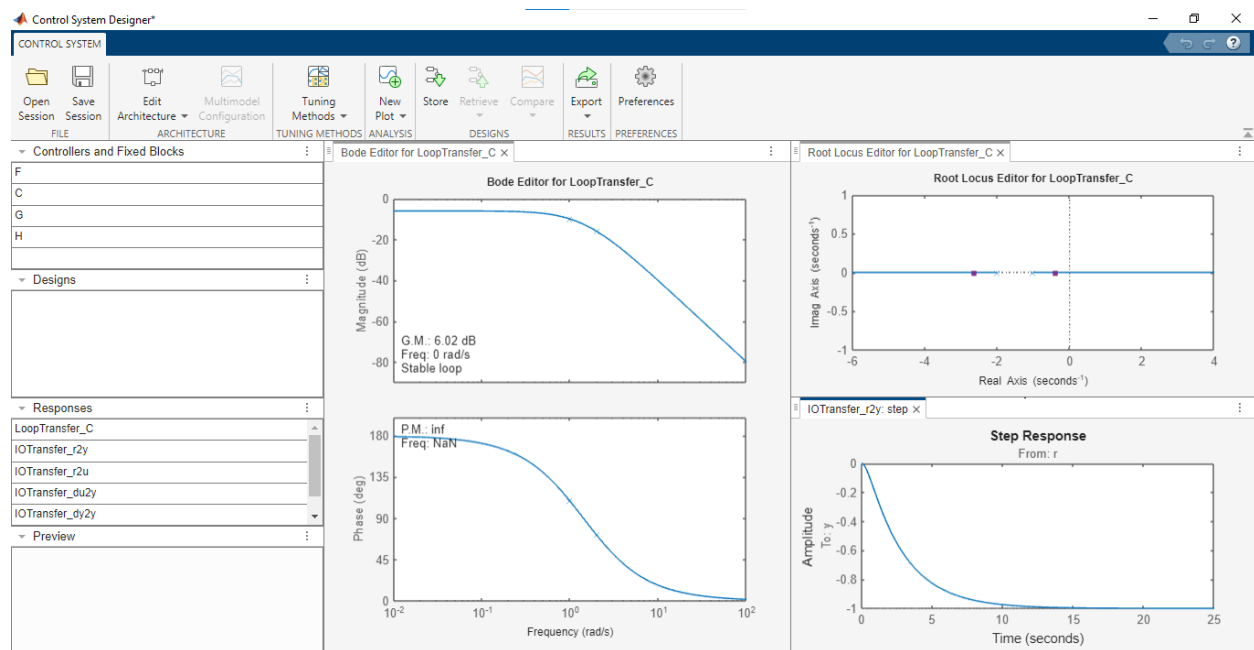
sys =

      -1
  -----
 s^2 + 3 s + 2

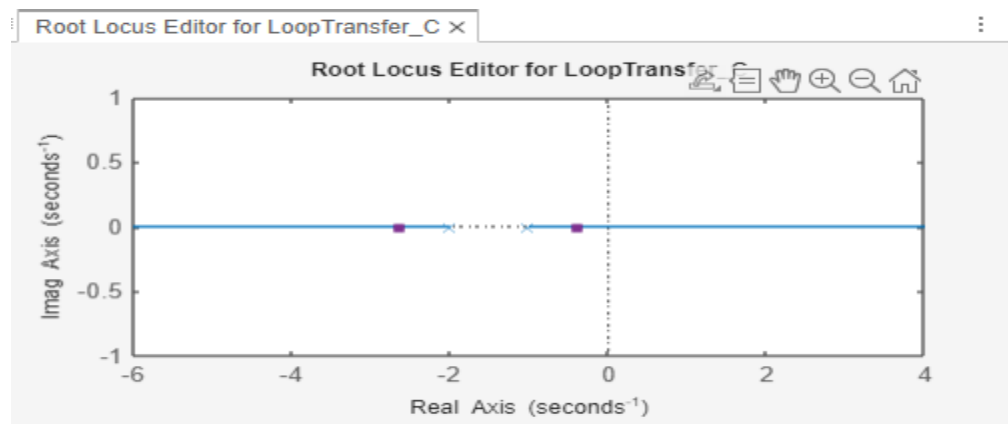
Continuous-time transfer function.
Model Properties

fx >>

```

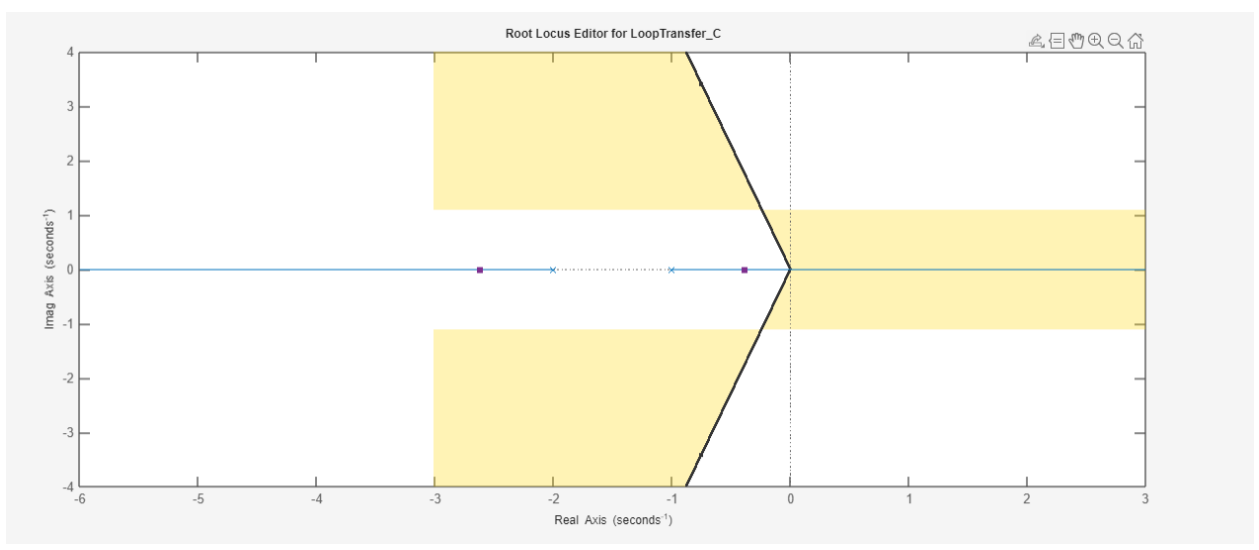


Root Locus Widows of The System



Value for % overshoot is set to less than 50

The screenshot shows the 'New Design Requirement' dialog box. The 'Design requirement type' is set to 'Percent overshoot (%)'. The 'Design requirement parameters' section shows the 'Percent overshoot (%)' set to 50.



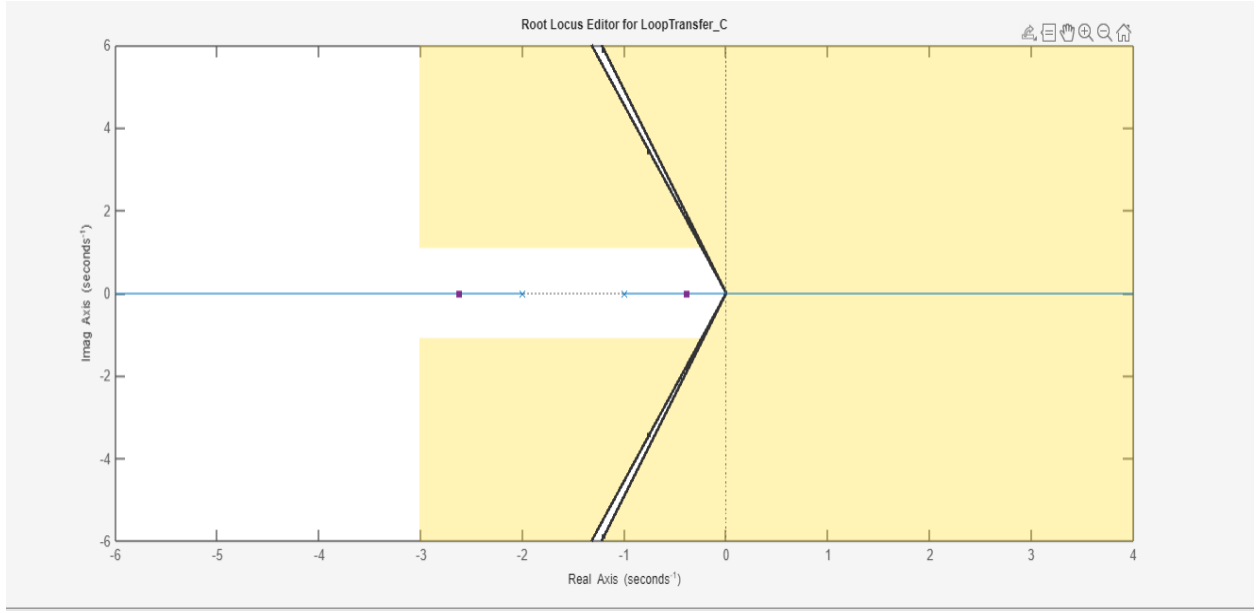
Value for damping ratio is set to greater than 0.2

New Design Requirement

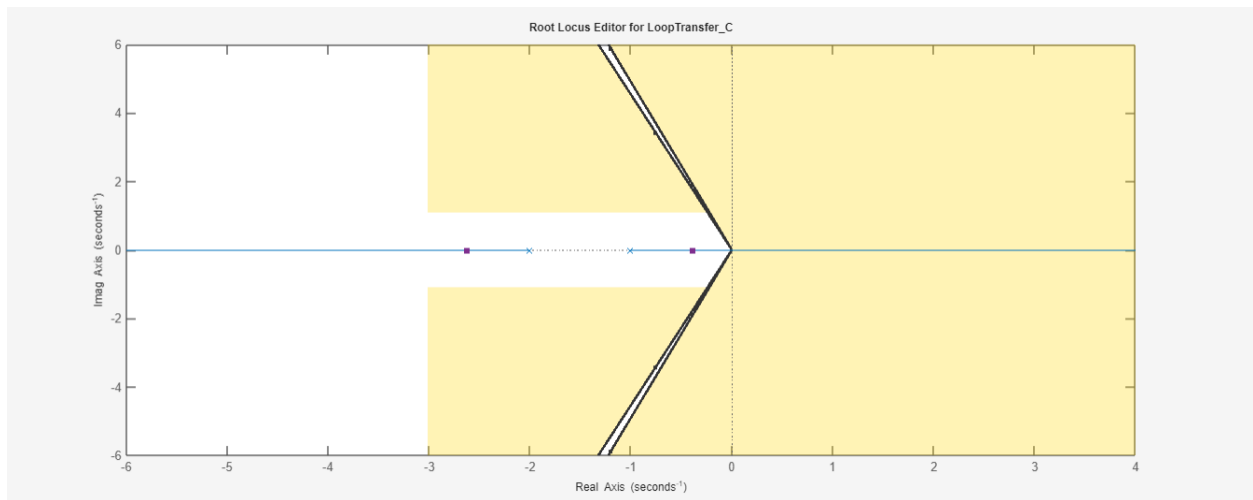
Design requirement type: Damping ratio

Design requirement parameters

Damping ratio > 0.2



Stability of system



After that stability of system is checked for different values of K. System is stable for all $K=2$. So, this system fulfills all the conditions.