Course: Control Systems	Code: ECC402
Experiment No.: 14	Experiment Date: 24 Apr,2025
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Aim: To find the root locus of given transfer function.

Software Used: MATLAB R2024a.

Theory: The root locus is a graphical method used in control systems to study how the roots of a system change with variation in a certain system parameter, typically the gain KKK. It helps analyze system stability and transient response by plotting the paths of closed-loop poles in the s-plane as KKK varies from 0 to ∞.

Procedure:

1. Define the transfer function by specifying the numerator (num) and denominator (den) coefficients.
2. Create the transfer function object using sys = tf(num, den);.
3. Use the rlocus(sys) command to plot the root locus of the transfer function.
4. Add a grid to the plot for better visualization using grid on;.
5. The root locus plot will display how the poles of the closed-loop system move in the s-plane as the gain changes.

Code:

1.

$$\frac{1}{s^3+9s^2+20s}$$

```
num=1;
den=[1 9 20 0];
sys=tf(num,den);
figure;
rlocus(sys)
grid on;
```

2.

$$\frac{1}{s^4+8s^3+37s^2+50s}$$

```
num=1;
den=[1 8 37 50 0];
sys=tf(num,den);
figure;
rlocus(sys)
grid on;
```

3.

$$\frac{s+1}{s^3+3.6s^2}$$

```
num=[1 1];
den=[1 3.6 0 0];
sys=tf(num,den);
figure;
rlocus(sys)
grid on;
```

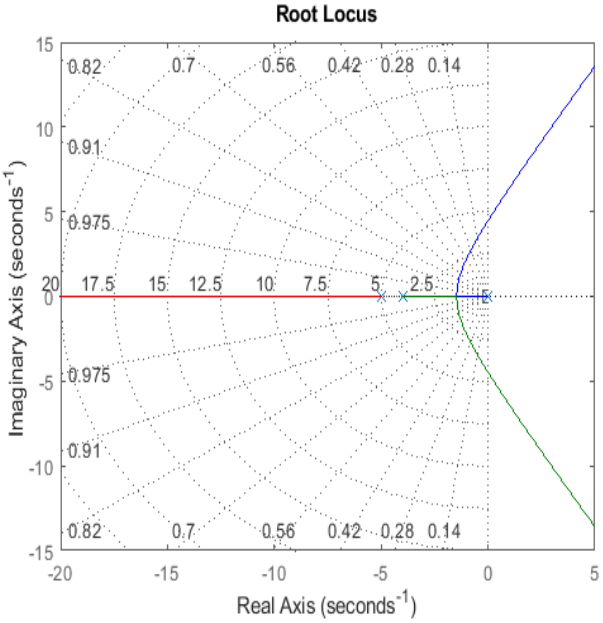
4.

$$\frac{1}{s^4+8s^3+36s^2+80s}$$

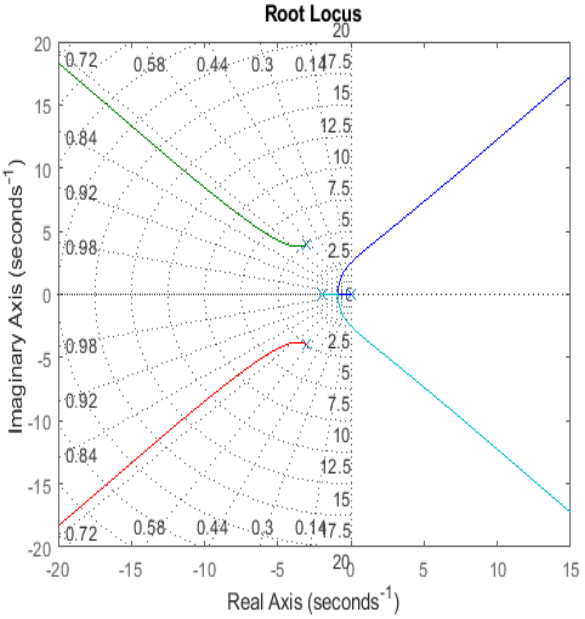
```
num=[1];
den=[1 8 36 80 0];
sys=tf(num,den);
figure;
rlocus(sys)
grid on;
```

Output:

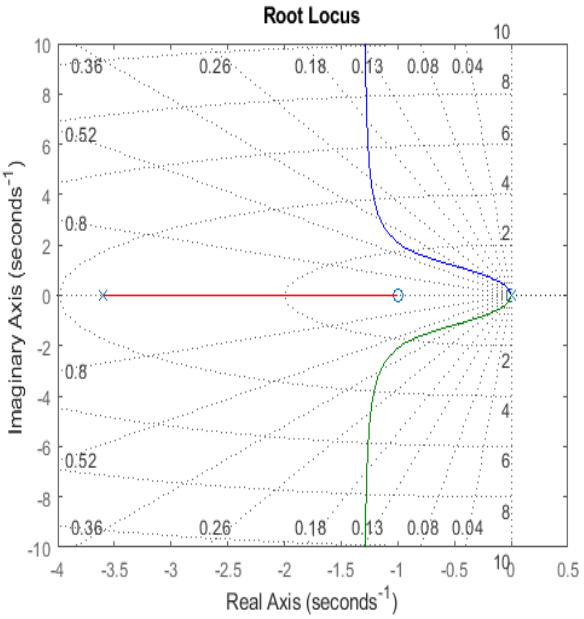
1.



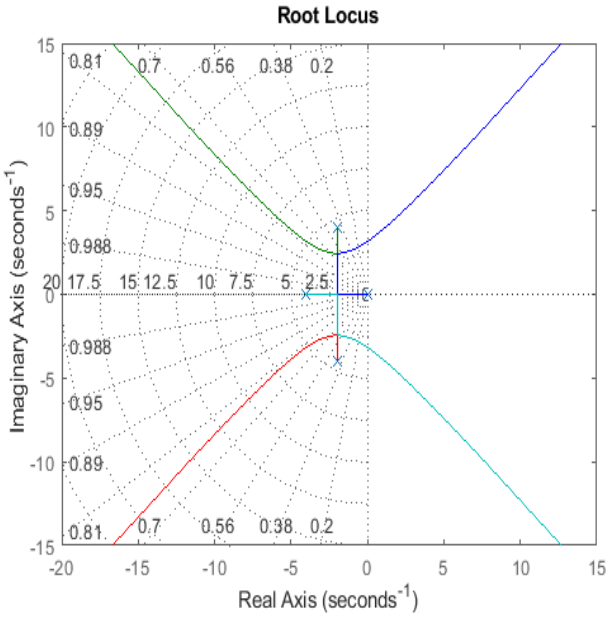
2.



3.



4.



Conclusion: The root locus plot provides insight into the stability and dynamic behaviour of the system as the gain varies. It helps in selecting an appropriate gain value to achieve desired performance.