CONTROL SYSTEMS (5th EE & IE)
COMPUTER LABORATORY

ASSIGNMENT 4

Test 1: Plot the root locus of the open-loop transfer function

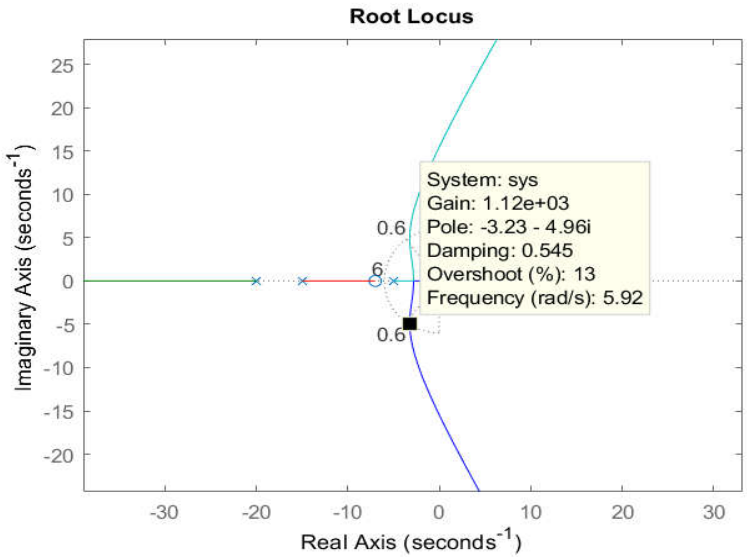
$$G(s) = \frac{(s+7)}{s(s+5)(s+15)(s+20)}$$

Obtain the value of gain, pole location and %overshoot for a damping ratio 0.6 and natural frequency 6 rad/sec.

MATLAB Code:

```
% define the numerator and denominator of the expression
num = poly([-7]);
den = poly([0 -5 -15 -20]);

% express the expression as transfer function
sys =tf(num,den);

% define natural frequency and damping ratio
w = 6;
z = 0.6;

% compute and plot root locus in matlab figure window
rlocus(sys);

% calculate value of gain, pole location and % overshoot
sgrid(z,w)
```

Figure window:



Test 2: Create an M-file to plot the root locus of the open loop transfer function

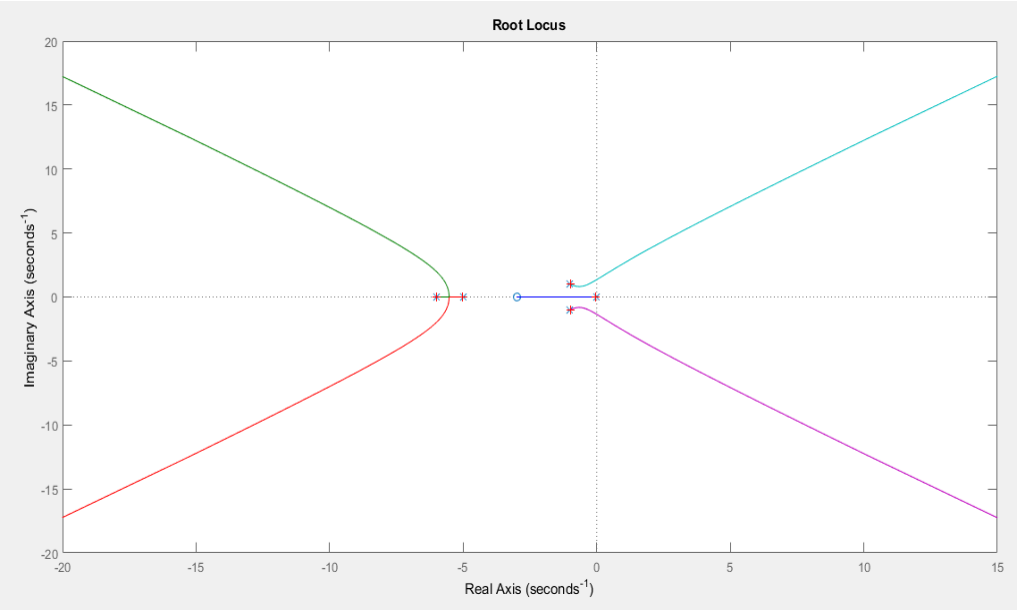
$$G(s) = \frac{K(s+3)}{s(s+5)(s+6)(s^2+2s+2)}$$

Test **rlocfind** command in this locus.

MATLAB Code:

```
% define the numerator and denominator of the expression
num = poly([-3]);
den = poly([0 -5 -6 -1+j -1-j]);

% express the expression as transfer function
sys = tf(num,den);

% compute and plot root locus in matlab figure window
rlocus(sys);

% returns the root locus gain and the closed-loop poles
[k, poles] = rlocfind(sys)
```

Figure window:



Output window:

```
Select a point in the graphics window
selected_point = 0.0296
k = 0.6108
poles =
  -5.9881 + 0.0000i
  -5.0145 + 0.0000i
  -0.9829 + 0.9839i
  -0.9829 - 0.9839i
  -0.0316 + 0.0000i
```