Table of Contents

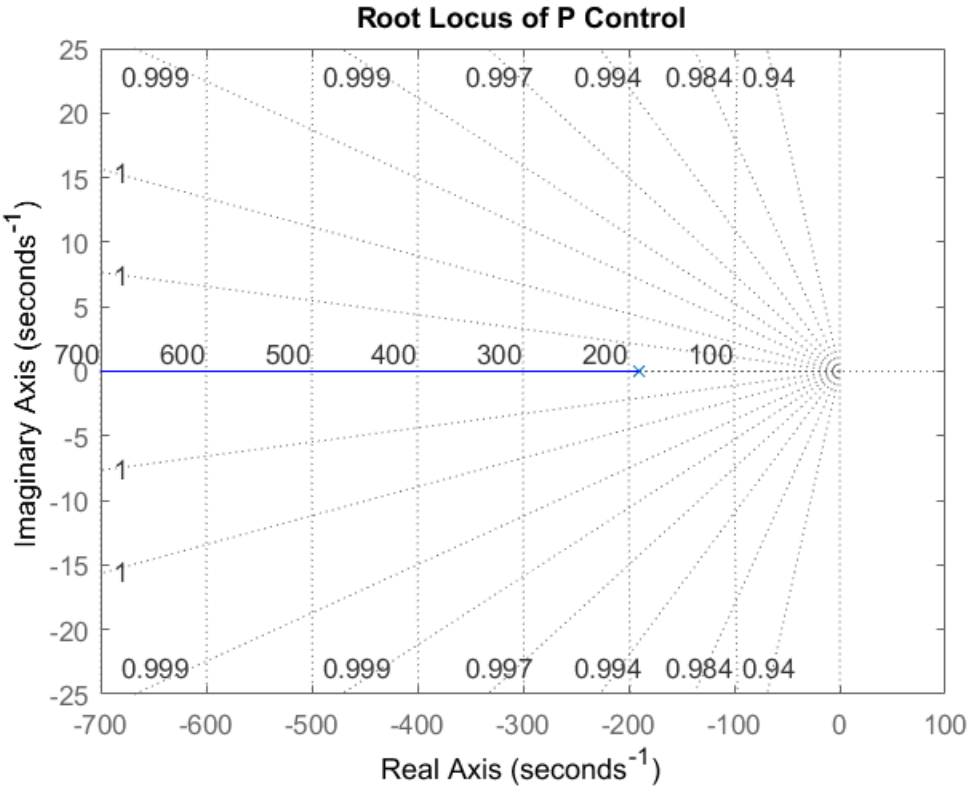

```
clear all
close all
clc
```

Parameters for all Controlers

```
Ktach=.000314159265; %rad/sec
R=4.2;
J=.0004;
B=.002;
Kt=6.6;
Ke=0.047;
Ka=-1;

tau_m=J/B;
```

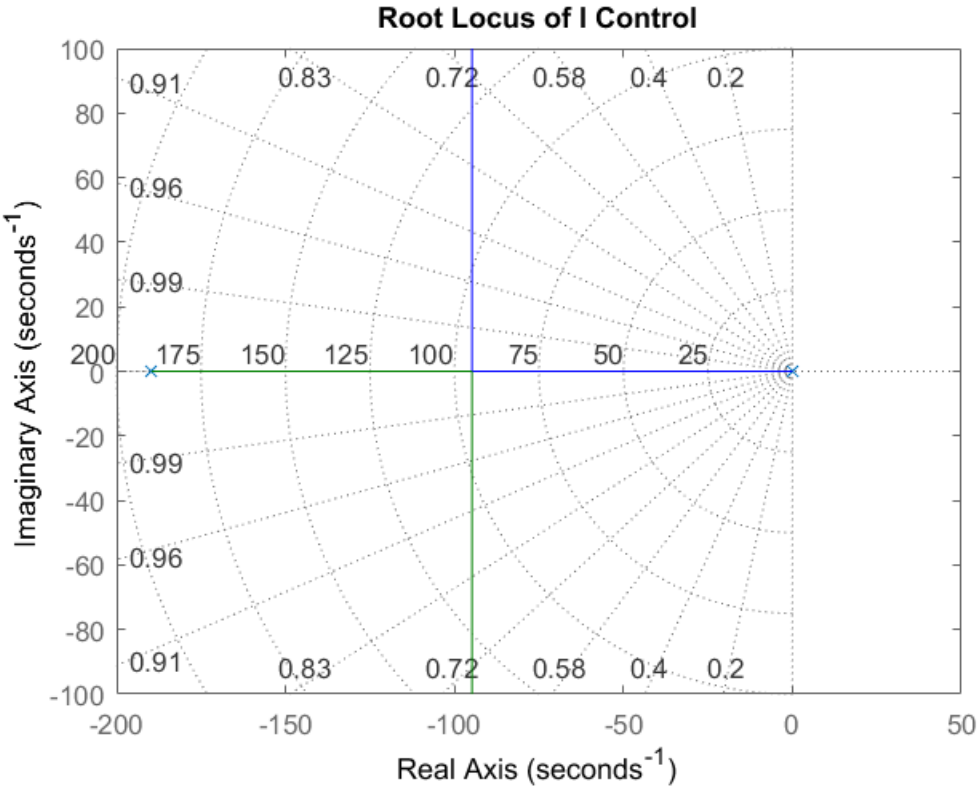
Part i (P Control)

```
Rf=150e3;
Ri=100e3;

num=1;
den=[(tau_m)/(1+((Ke*Kt)/(R*B))), 1];
rlocus(num, den)
grid minor
title('Root Locus of P Control')

ess_P=(-Rf/Ri)*Ka*(Kt/(R*B))*(1/(1+(Ke*Kt/(R*B))))*Ktach;
```



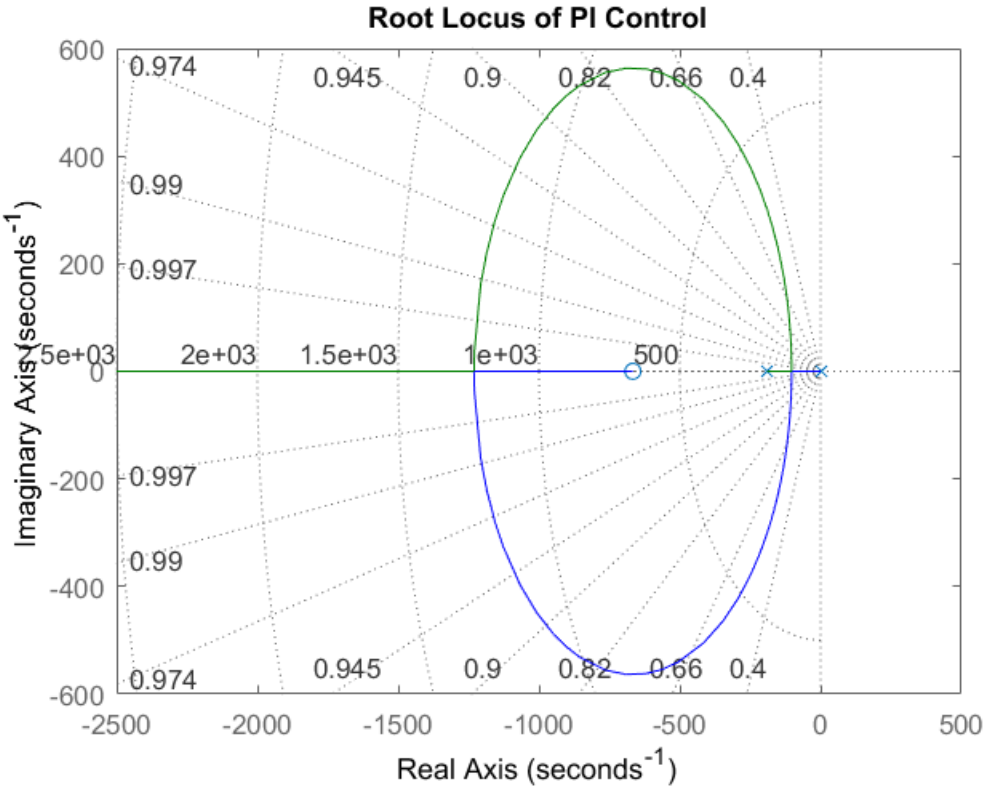
Part ii (I Control)

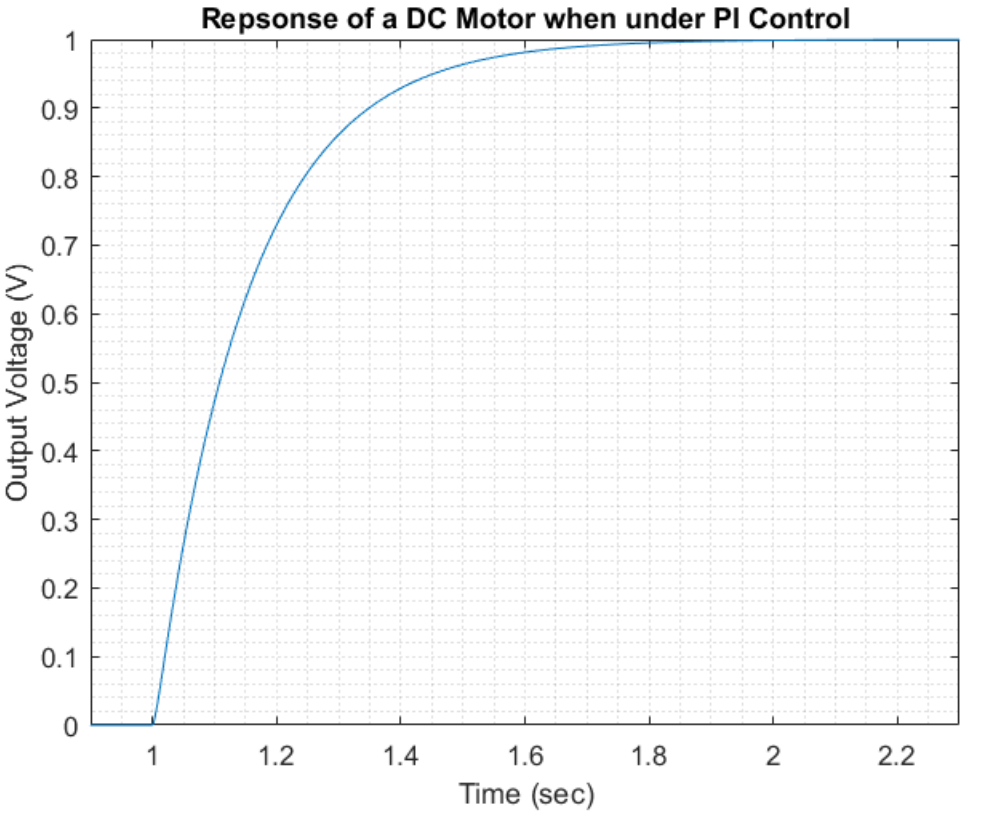
```
figure
C1=.033e-6;
num=1;
den1=[Ri*C1, 0];
denP=conv(den1, den);
rlocus(num, denP)
grid minor
title('Root Locus of I Control')
```



Part iii (PI Control)

```
figure
C2=0.010e-6;
num=[Rf*C2, 1];
den2=[Ri*C2, 0];
denPI=conv(den2, den);
rlocus(num, denPI)
grid minor
title('Root Locus of PI Control')
figure
sim('HW5_sim.slx')
plot(t, e_out)
grid minor
xlabel('Time (sec)')
ylabel('Output Voltage (V)')
title('Repsonse of a DC Motor when under PI Control')
xlim([.9,2.3])
```


Root Locus of PI Control
Imaginary Axis (seconds-1)
Real Axis (seconds-1)
0.974
0.945
0.9
0.82
0.66
0.4
0.99
0.997
2e+03
1.5e+03
1e+03
500
600
400
200
0
-200
-400
-600
-2500
-2000
-1500
-1000
-500
0
500


Repsonse of a DC Motor when under PI Control
Output Voltage (V)
Time (sec)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1
1.2
1.4
1.6
1.8
2
2.2

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