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

Problem #1 %Undamped System

```
%Ogata B-3-13

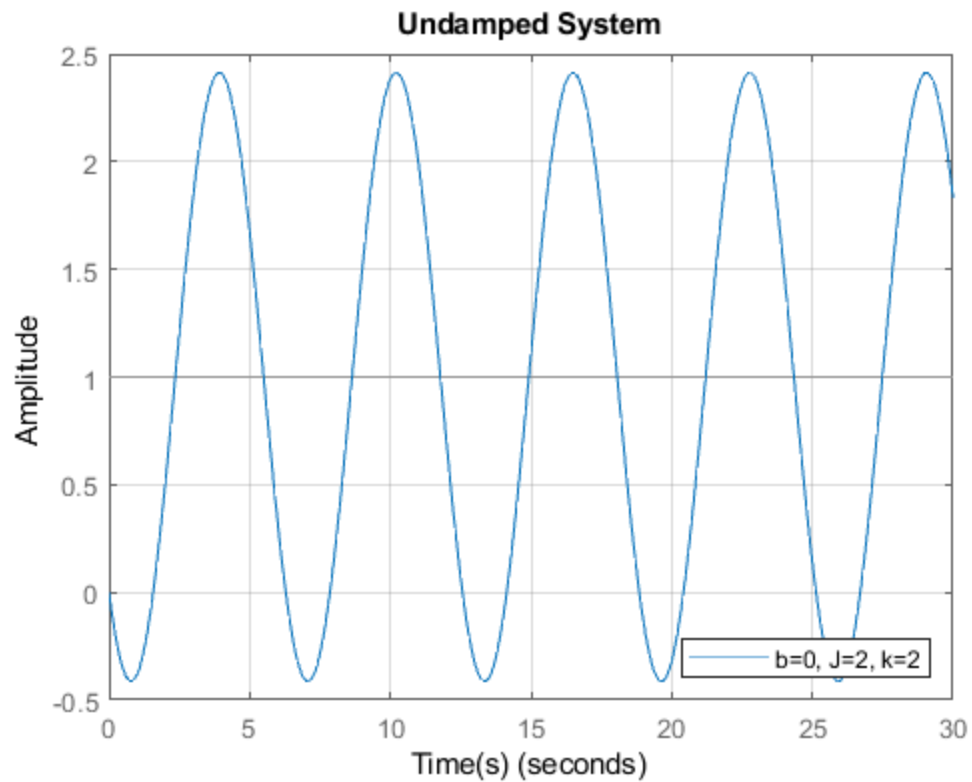
%System
J=2; %Inertia of spinning disk
k=2; %Spring constant
b=0; %Damper constant [Changes per system dynamic]

K=1;
w_n=1;
squiggle=0; %Squiggle [Changes per systemd dynamic]

num=1; %Second order transfer function numerator
den=[1/w_n,2*squiggle/w_n,1]; %Second order transfer function
    denominator

sys_tf=tf(num,den);
sys_ss=ss(sys_tf);

figure
hold on
timespan=0:0.1:30;
output=ones(1,301);
lsim(sys_ss,output,timespan,[-1,0]);
grid;
title('Undamped System')
xlabel('Time(s)');
ylabel('Amplitude');
legend('b=0, J=2, k=2','location','southeast')
hold off
```



Problem #1 %Critically Damped System

```
%System
J=2; %Inertia of spinning disk
k=2; %Spring constant
b=4; %Damper constant [Changes per system dynamic]

K=1;
w_n=1;
squiggle=1; %Squiggle [Changes per systemd dynamic]

num=1; %Second order transfer function numerator
den=[1/w_n,2*squiggle/w_n,1]; %Second order transfer function
denominator

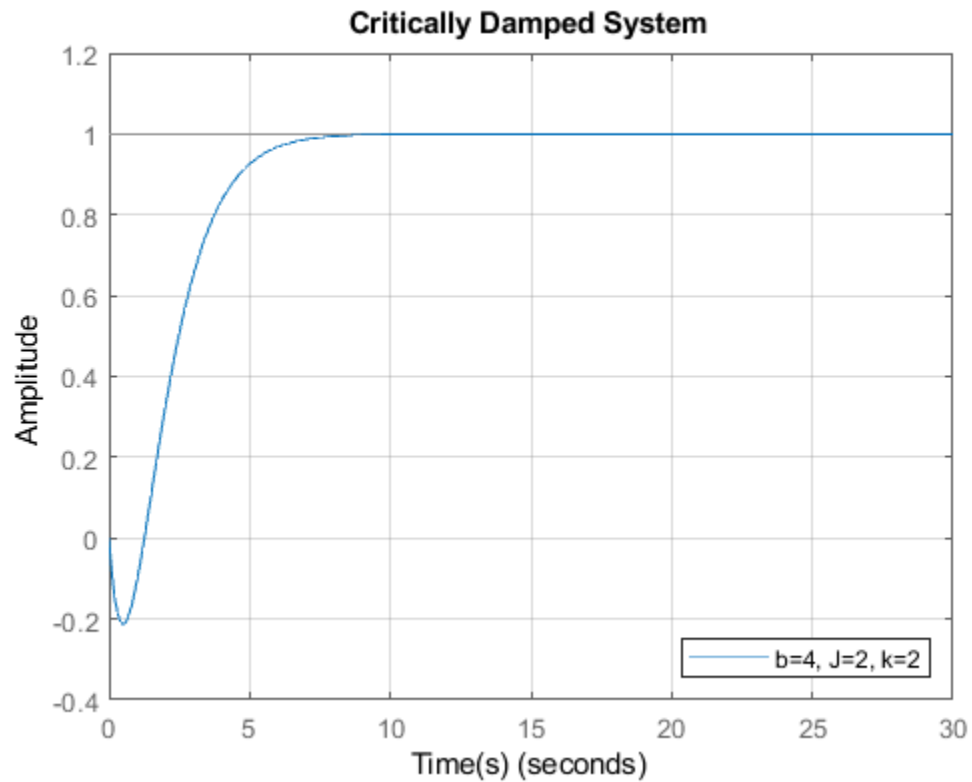
sys_tf=tf(num,den);
sys_ss=ss(sys_tf);

figure
hold on
timespan=0:0.1:30;
output=ones(1,301);
lsim(sys_ss,output,timespan,[-1,0]);
grid;
title('Critically Damped System')
```

```

xlabel('Time(s)');
ylabel('Amplitude');
ylim([-0.4,1.2])
legend('b=4, J=2, k=2','location','southeast')
hold off

```



Problem #1 %Overdamped System

```

%System
J=2; %Inertia of spinning disk
k=2; %Spring constant
b=8; %Damper constant [Changes per systemd dynamic]

K=1;
w_n=1;
squiggle=2; %Squiggle [Changes per systemd dynamic]

num=1; %Second order transfer function numerator
den=[1/w_n,2*squiggle/w_n,1]; %Second order transfer function
    denominator

sys_tf=tf(num,den);
sys_ss=ss(sys_tf);

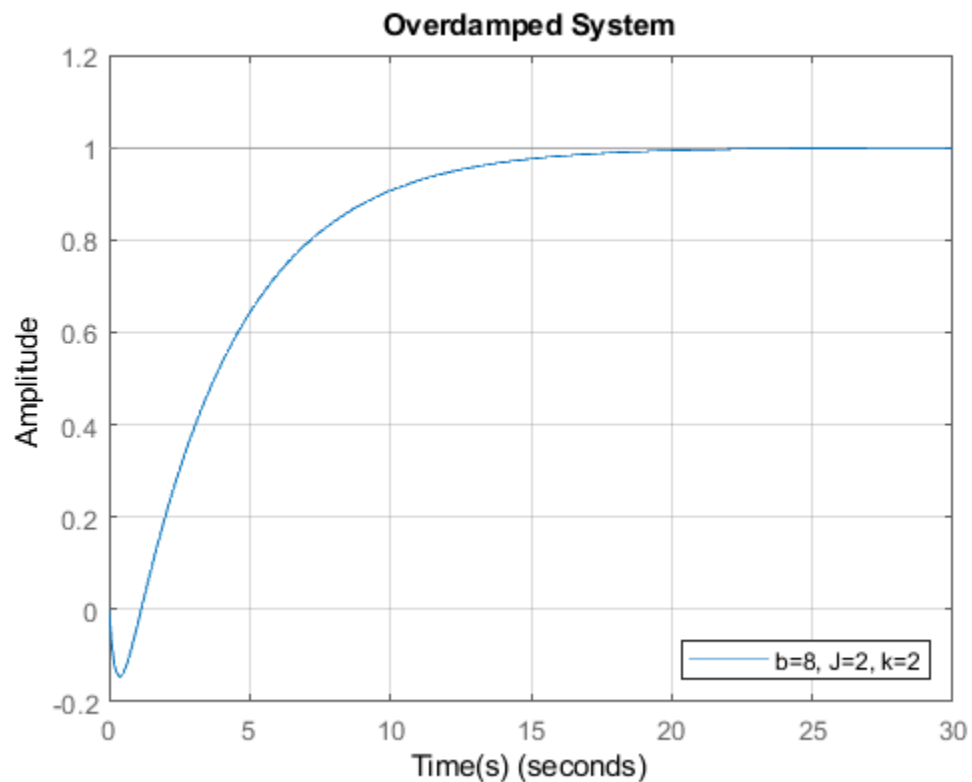
figure
hold on

```

```

timespan=0:0.1:30;
output=ones(1,301);
lsim(sys_ss,output,timespan,[-1,0]);
grid;
title('Overdamped System')
xlabel('Time(s)');
ylabel('Amplitude');
ylim([-0.2,1.2])
legend('b=8, J=2, k=2','location','southeast')
hold off

```



Problem #1 %underdamped System

```

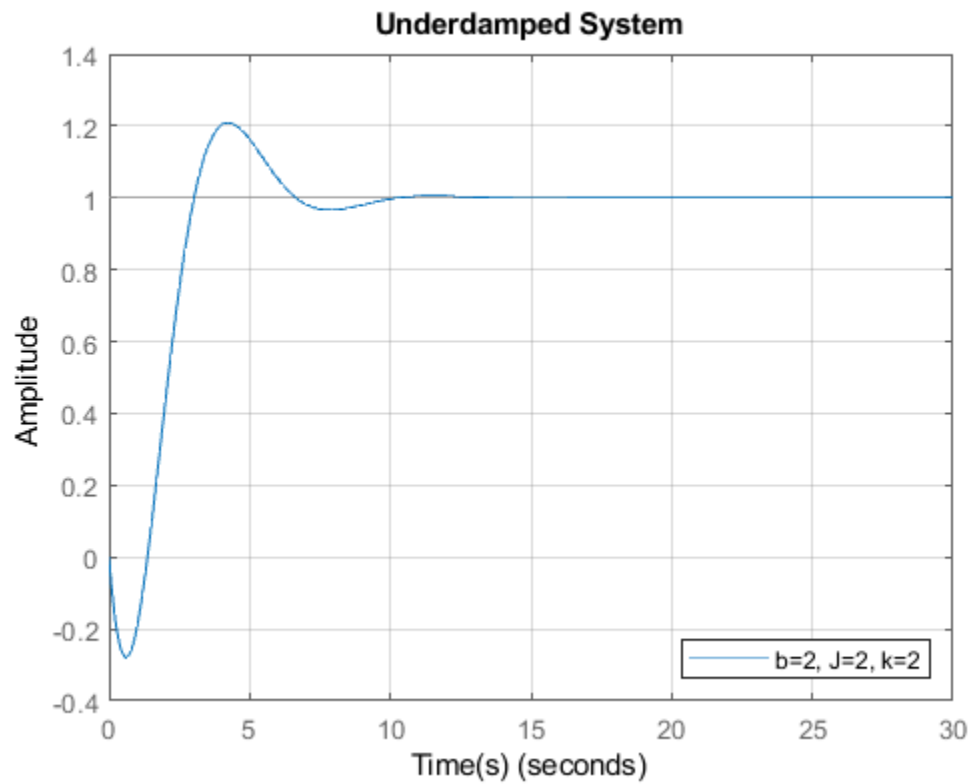
%System
J=2; %Inertia of spinning disk
k=2; %Spring constant
b=2; %Damper constant [Changes per system dynamic]

K=1;
w_n=1;
squiggle=.5; %Squiggle [Changes per system dynamic]

num=1; %Second order transfer function numerator
den=[1/w_n,2*squiggle/w_n,1]; %Second order transfer function
denominator

```

```
sys_tf=tf(num,den);  
sys_ss=ss(sys_tf);  
  
figure  
hold on  
timespan=0:0.1:30;  
output=ones(1,301);  
lsim(sys_ss,output,timespan,[-1,0]);  
grid;  
title('Underdamped System')  
xlabel('Time(s)');  
ylabel('Amplitude');  
legend('b=2, J=2, k=2','location','southeast')  
hold off
```



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