Homework 2 - Problem 4

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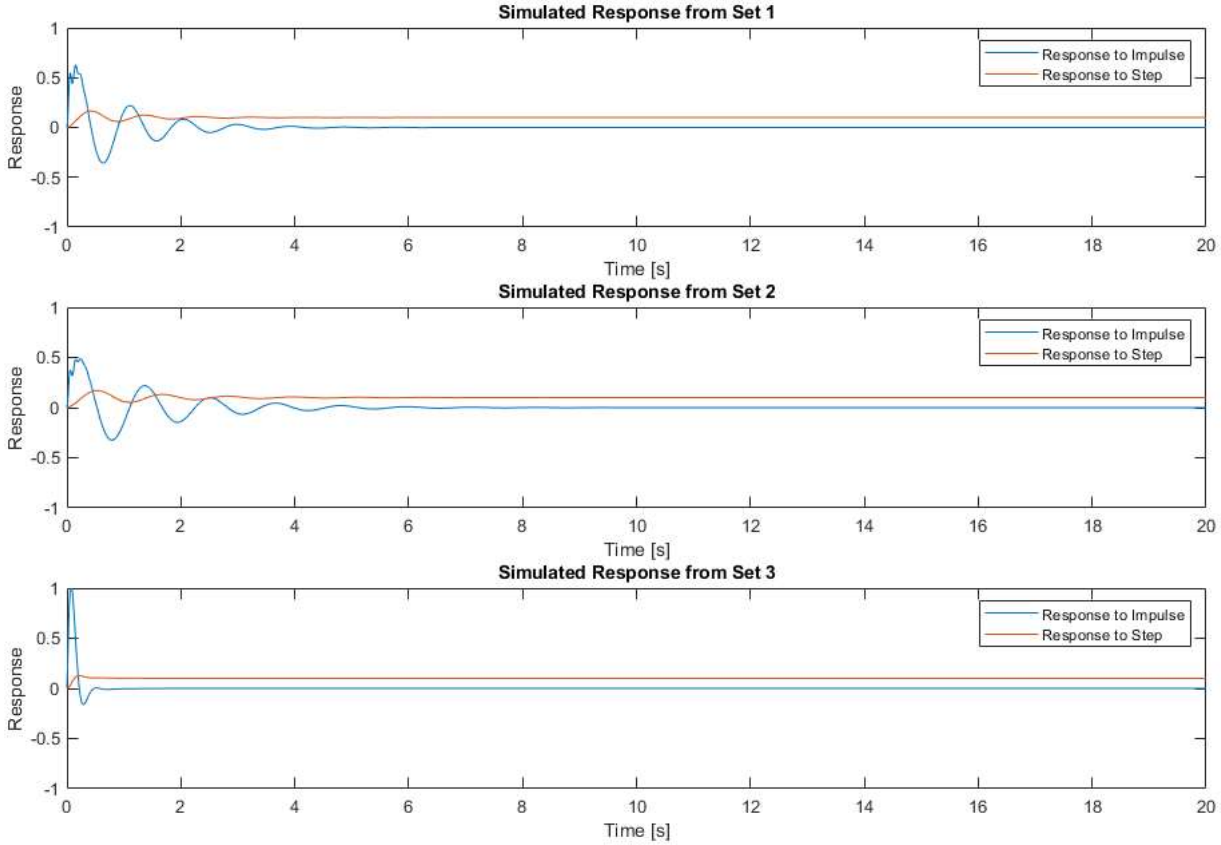
```
close all;
clear;
clc;

% Define variables in vectors with index corresponding to set #
Mw = [50,50,50];
Mb = [400,600,600];
Kw = [200000,200000,200000];
Ks = [20000,20000,20000];
Bs = [1000,1000,10000];

% Generate figure for plotting, adjusting size for publishing
x = figure('Position',[300 200 1100 700]);

for i = 1:length(Mw)
% Define the transfer function
s = tf('s');
sys = ((Ks(i)+Bs(i)*s)*Kw(i))/((Mb(i)*s^2+Ks(i)+Bs(i)*s)*(Mw(i)*s^2+Ks(i)+Bs(i)*s+Kw(i))-(Ks(i)+Bs(i)*s)^2);

% Define the time
t = [0:0.01:20];

% Define the system's response to impulse and step w/ magnitudes of 0.1
y1 = 0.1*impulse(sys, t);
y2 = 0.1*step(sys, t);

% Defining subplot and plotting results over one another at sp location
subplot(3,1,i);
plot(t, y1);
hold on;
plot(t, y2);

% Generate common y-axis sizes for comparability
ylim([-1,1]);

% Generate labels on the graph for axes, title, and legend
xlabel('Time [s]');
ylabel('Response');
title (strcat("Simulated Response from Set ",num2str(i)));
legend('Response to Impulse', 'Response to Step');
end

% PART C COMMENTS:
    % Going from set 1 to 2, the variable changed is Mb, the mass of the car
    % body. Increasing this value will cause more oscillation in the system,
    % due to the system having to dampen a larger object with more energy. This
    % is seen when comparing the graphs between 1 and 2.

    % Going from set 2 to 3, the factor changed is Bs, the dampening
    % coefficient of the damper. This value is increased 10x, which directly
    % increases the dampening force exuded by the damper. By increasing this,
    % the system oscillates much less than the previous systems, as seen in the
    % graph for set 3.
```



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