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Lab 8

Task 1:

Code:

```
syms t %Create fresh symbolic variables for
% interactive symbolic workflows
h=t.^2;
int(abs(h),t,-inf,inf) %  returns the
% absolute value of each element in array
% int(expr,var,a,b) computes the definite
%integral of expr with respect to the
% symbolic scalar variable var from a to b.

```

```
Command Window
New to MATLAB? See resources for Getting Started.
>> Lab8_Task1

ans =

Inf
```

THUS SYSTEM IS UNSTABLE.

Task 2:

Code:

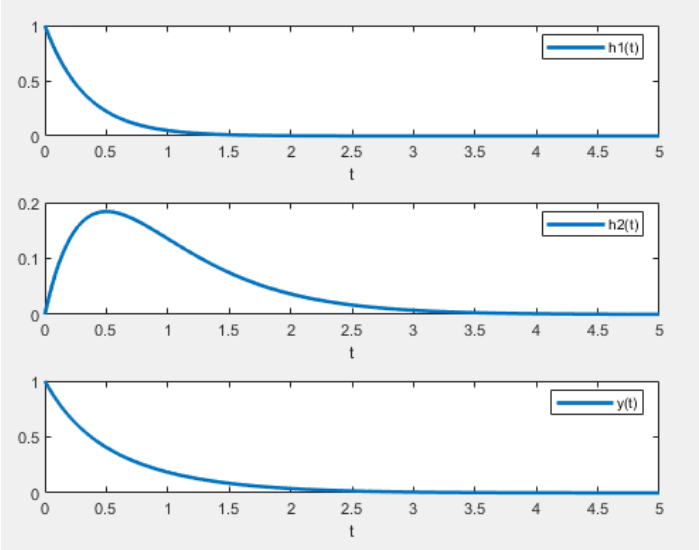
```
step = 0.01;
t = 0:step:5; %  creates a regularly-spaced vector
u = ones(size(t)); % returns a matrix of 1's

subplot(3,1,1)
h1 = u.*exp(-3.*t);
plot(t,h1,'LineWidth',2)
legend('h1(t)')
xlabel('t')

subplot(3,1,2)
h2 = t.*exp(-2.*t).*u; % gives the value of the
% exponential function
plot(t,h2,'LineWidth',2)
legend('h2(t)')
xlabel('t')

subplot(3,1,3)
y = h1 + h2;
plot(t,y,'LineWidth',2)
legend('y(t)')
xlabel('t')

syms t
final = exp(-3.*t)+(t.*exp(-2.*t));
int(abs(final),t,0,inf) %  returns the
% absolute value of each element in array
```

```
% int(expr,var,a,b) computes the definite
%integral of expr with respect to the
% symbolic scalar variable var from a to b.
```

```
Command Window
New to MATLAB? See resources for Getting Started.
>> Lab8_Task2

ans =

7/12
```

SYSTEM IS BIBO STABLE

Graph:



Task 3:

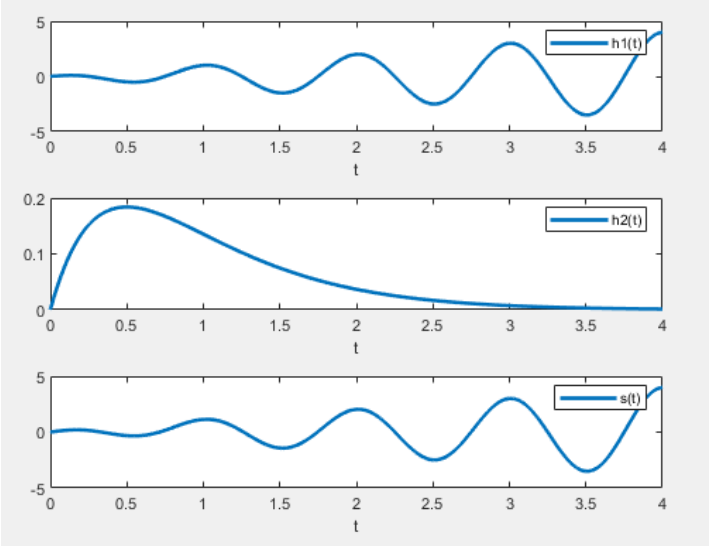
Code:

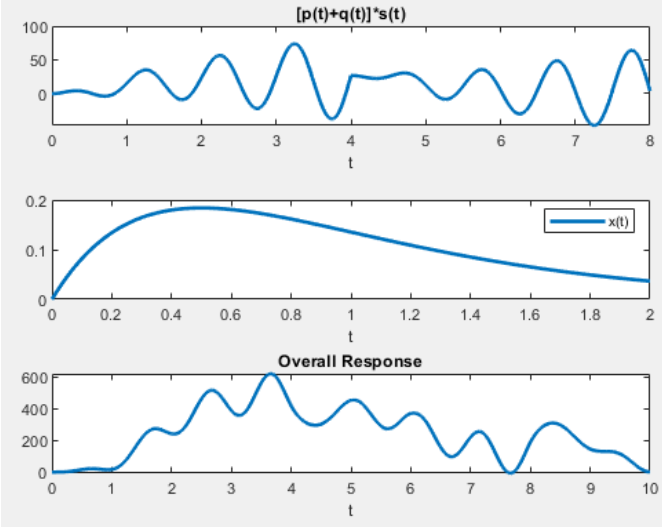
```
step = 0.01;
t = 0:step:4; %  creates a regularly-spaced vector

subplot(3,1,1)
h1 = t.*cos(2.*pi.*t);
plot(t,h1,'LineWidth',2)
legend('h1(t)')
xlabel('t')

subplot(3,1,2)
h2 = t.*exp(-2.*t);
plot(t,h2,'LineWidth',2)
legend('h2(t)')
xlabel('t')

subplot(3,1,3)
h3 = ones(size(t));
s12 = h1+h2;
plot(t,s12,'LineWidth',2)
legend('s(t)')
xlabel('t')
```

```
figure(); % creates a new figure window
subplot(3,1,1)
t1 = 0:step:8;
h = conv(s12,h3);
plot(t1,h,'LineWidth',2)
title('[p(t)+q(t)]*s(t)')
xlabel('t')

subplot(3,1,2)
tx = 0:step:2;
x = tx.*exp(-2.*tx);
plot(tx,x,'LineWidth',2)
legend('x(t)')
xlabel('t')

subplot(3,1,3)
t2 = 0:step:10; %  creates a regularly-spaced vector
h = conv(x,h); % convolution
plot(t2,h,'LineWidth',2)
title('Overall Response')
xlabel('t')
```

IT IS BIBO STABLE

Graph:





Task 4:

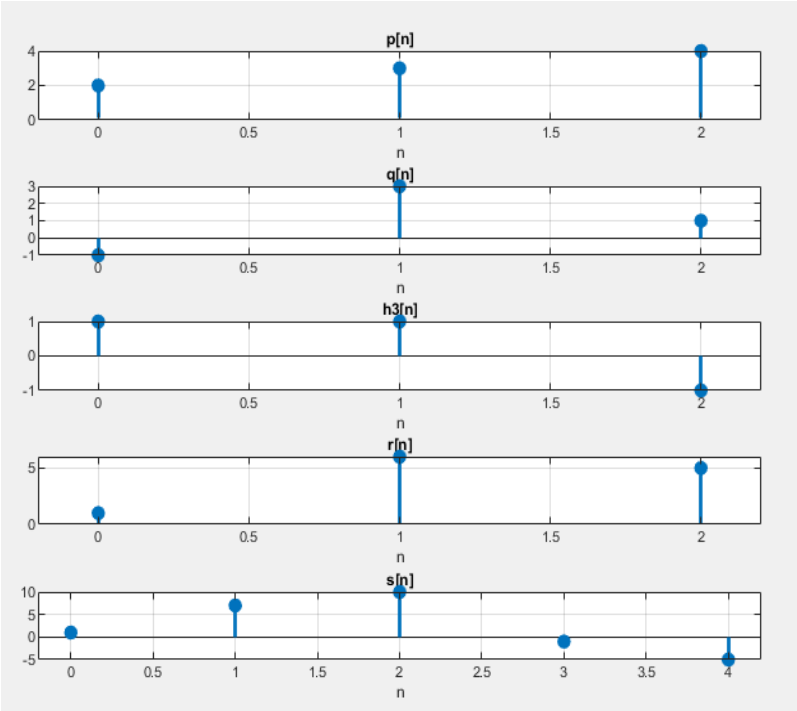
Code:

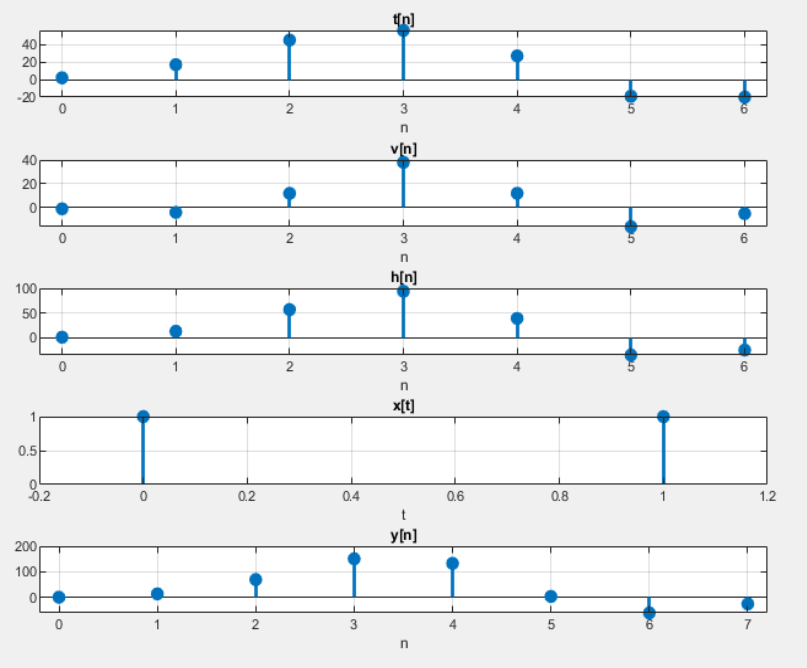
```
n = 0:2;
h1 = [2,3,4];
h2 = [-1,3,1];
h3 = [1,1,-1];

subplot(5,1,1)
stem(n,h1,'fill','Linewidth',2),grid on
title('p[n]')
xlabel('n')
xlim([-0.2 2.2])

subplot(5,1,2)
stem(n,h2,'fill','Linewidth',2),grid on
title('q[n]')
xlabel('n')
xlim([-0.2 2.2])

subplot(5,1,3)
stem(n,h3,'fill','Linewidth',2),grid on
title('h3[n]')
xlabel('n')
xlim([-0.2 2.2])

pq=h1+h2;
subplot(5,1,4)
stem(n,pq,'fill','Linewidth',2),grid on
title('r[n]')
xlabel('n')
xlim([-0.2 2.2])

n1 = 0:4;
rn = conv (pq,h3); % convolution
subplot(5,1,5)
stem(n1,rn,'fill','Linewidth',2),grid on
title('s[n]')
xlabel('n')
xlim([-0.2 4.2])

figure(); % creates a new figure window
n2 = 0:6;
rx = conv(rn,h1); %convolution
subplot(5,1,1)
stem(n2,rx,'fill','Linewidth',2),grid on
title('t[n]')
xlabel('n')
xlim([-0.2 6.2])

n3 = 0:6;
h11 = conv(rn,h2);
subplot(5,1,2)
stem(n3,h11,'fill','Linewidth',2),grid on
title('v[n]')
xlabel('n')
xlim([-0.2 6.2])


n4 = 0:6;
h = rx+h11;
subplot(5,1,3)
stem(n4,h,'fill','Linewidth',2),grid on
title('h[n]')
xlabel('n')
xlim([-0.2 6.2])

xn = 0:1;
x = ones(size(xn));
subplot(5,1,4)
stem(xn,x,'fill','Linewidth',2),grid on
title('x[t]');
xlabel('t')
xlim([-0.2 1.2])
ty = 0:7;
```

```
y = conv(x,h);
subplot(5,1,5)
stem(ty,y,'fill','Linewidth',2),grid on
title('y[n]')
xlabel('n')
xlim([-0.2 7.2])

syms n
```

SYSTEM IS UNSTABLE

Graph:





Critical Analysis:

In this lab I learnt:

- Various properties of time domain signals such as commutative property, associative property, distributive property.
- BIBO stable systems are those that have a bounded output for every bounded input.
- BIBO stability of both continuous and discrete systems can be observed.

Interconnection of systems may be cascade, parallel or feedback.

THE END