

Course Name: Analog Communication

MATLAB Experiment-4

Objective – Write MATLAB code to study *linear and time invariance* properties of an LTI system for $x(t)$ and $h(t)$ with the value 1 ranging from $t=-1$ and $t=1$

MATLAB Code:

```
t = -5:0.01:5; % input
X = @(t) (t>=-1 & t<=1);
H = @(t) (t>=-1 & t<=1);
Y = @(t) conv(X(t) , H(t)); % output

S = @(X) conv(X , H(t));

a1 = 2; a2 = 3; % amplitude given by user

t = -5:0.01:5;

x1 = a1.*X(t);
x2 = a2.*X(t);

subplot(1,2,1);
plot(S(x1+x2));
title('S(a1*x1(t) + a2*x2(t))');

y1 = a1.*Y(t);
y2 = a2.*Y(t);

subplot(1,2,2);
plot(y1+y2);
title("a1*y1(t) + a2*y2(t)");

figure;

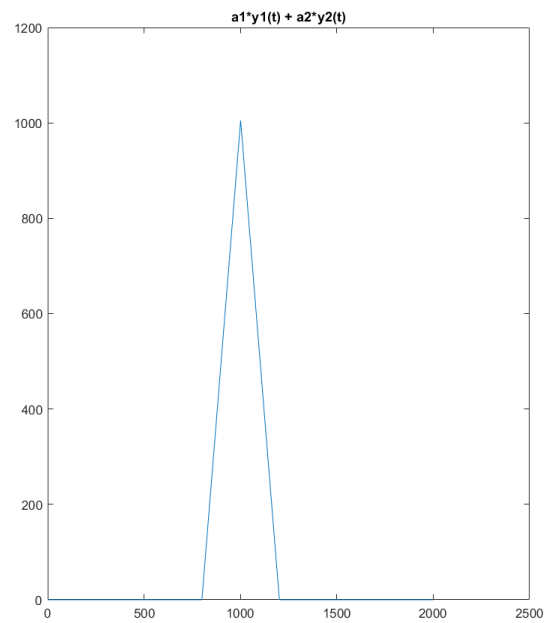
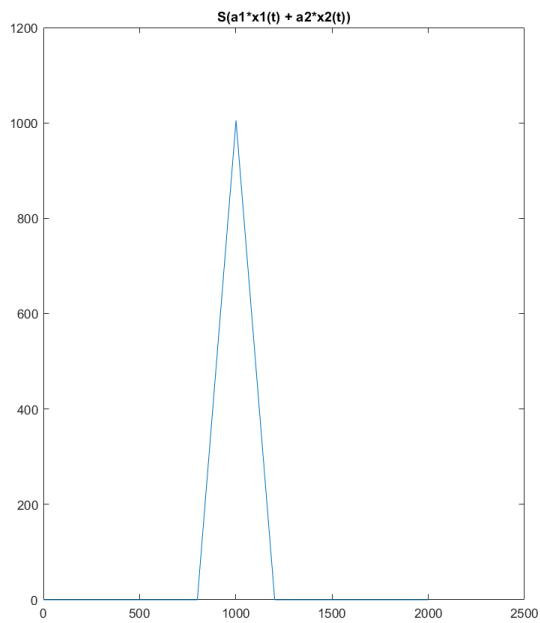
T = 4;

subplot(1,2,1);
YT = conv(X(t - T) , H(t));
plot(YT);
title("Y(t-T)");

subplot(1,2,2);
plot(S(X(t-T)));
title("S(x(t-T))");
```

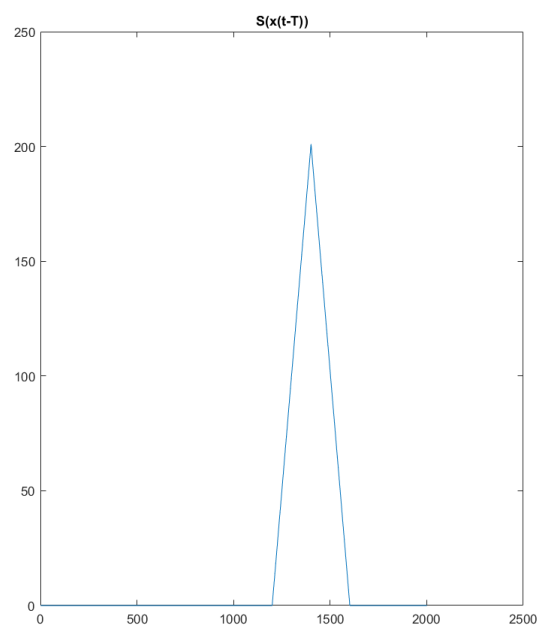
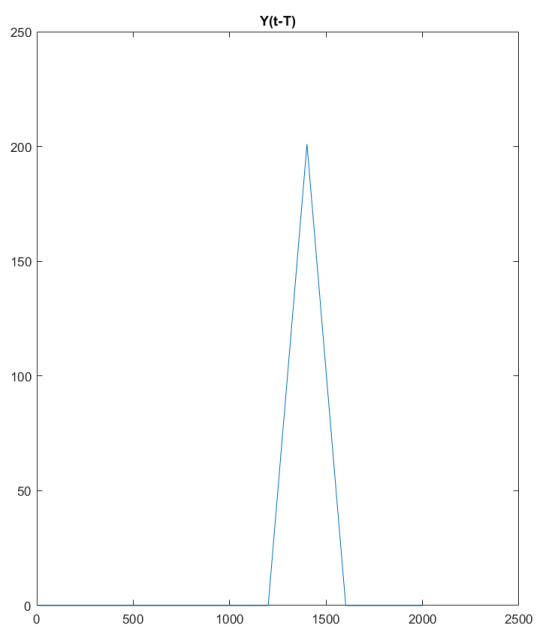
Result:

Graph 1:



Inference: Both graphs are similar so function $Y(t) = X(t)$ should be linear.

Graph 2:



Inference: Both the graphs are similar, means $Y(t) = X(t)$ must be time invariant.