1. Write a matlab code for linear convolution of two time-limited continuous signals and demonstrate its application on the following pair of signals along with a theoretical validation

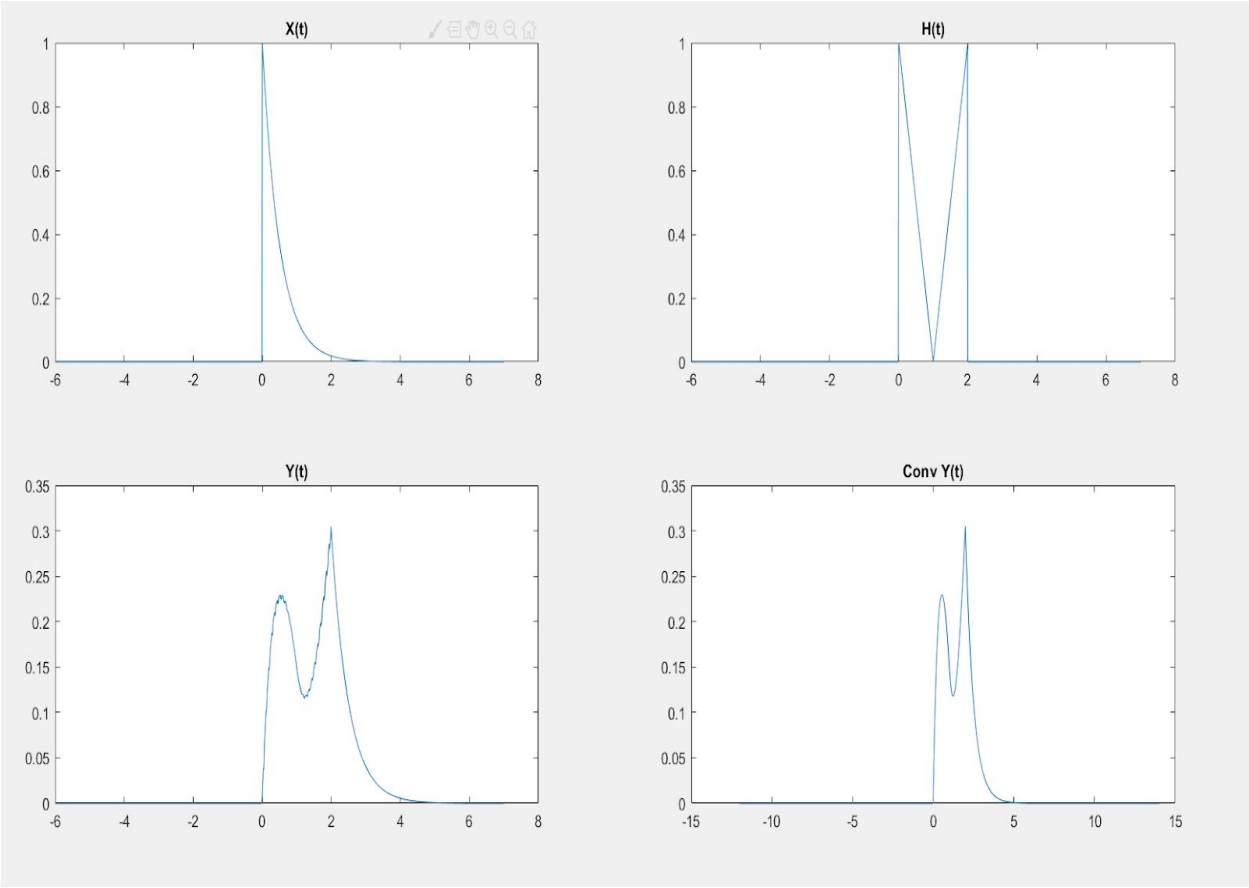
$$x(t) = exp(-2t)(u(t) - u(t-4))$$

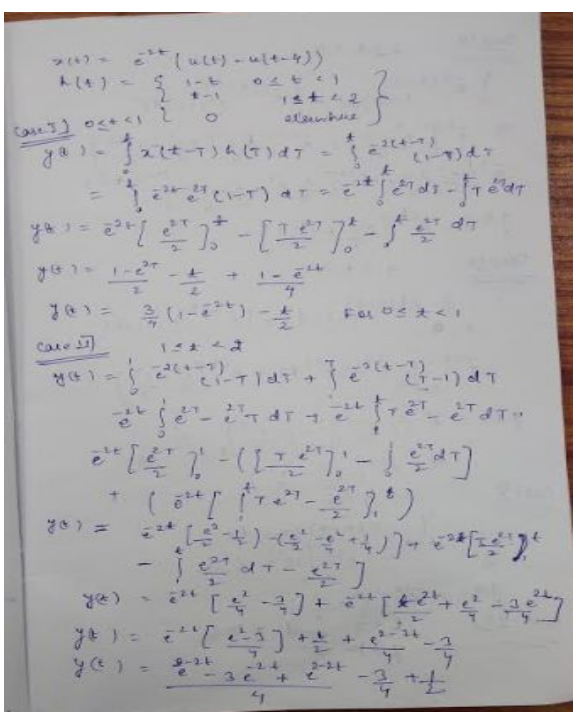
and

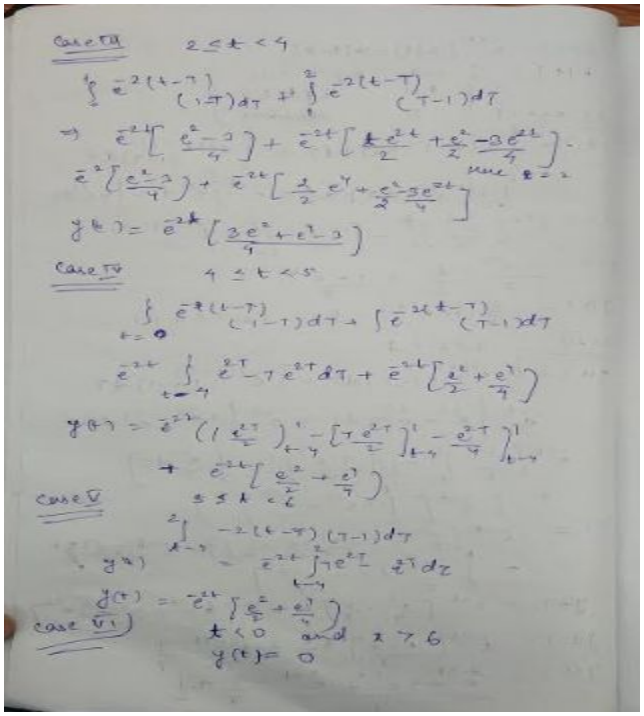
$$h(t) = \begin{cases} 1-t & 0 \le t < 1 \\ t-1 & 1 \le t < 2 \\ 0 & elsewhere \end{cases}$$

```
t=-6:0.01:7;
h=H(t);
x=exp(-2*t).*(u(t)-u(t-4));
T=-10:0.01:20;
xT=zeros(size(T));
hT=zeros(size(T));
hT=H(T);
xT=exp(-2*T).*(u(T)-u(T-4));
for i=1:length(t)
        k=t(i);
        xT=exp(-2*(k-T)).*(u(k-T)-u(k-T-4));
        y(i)=trapz(T,xT.*hT);
end
b=-12:0.01:14;
z=conv(x,h);
subplot(221);
plot(t,x);
title('X(t)');
subplot(222);
plot(t,h);
title('H(t)');
subplot(223);
plot(t,y);
title('Y(t)');
subplot(224);
plot(b,z/100);
title('Conv Y(t)');
function x = H(t)
```

```
x = zeros(size(t));
x(t<1)=0;
x(t>=0 & t<1)=1-t(t>=0 & t<1);
x(t>=1 & t<2)=t(t>=1 & t<2)-1;
x(t>=2)=0;
end
function x = u(t)
x = zeros(size(t));
x(t>=0)=1;
End
```







2. Use the same convolution function to convolve the following signals. (Theoretical verification is not necessary)

$$x(t) = \ln(t)(u(t) - u(t-3))$$

and

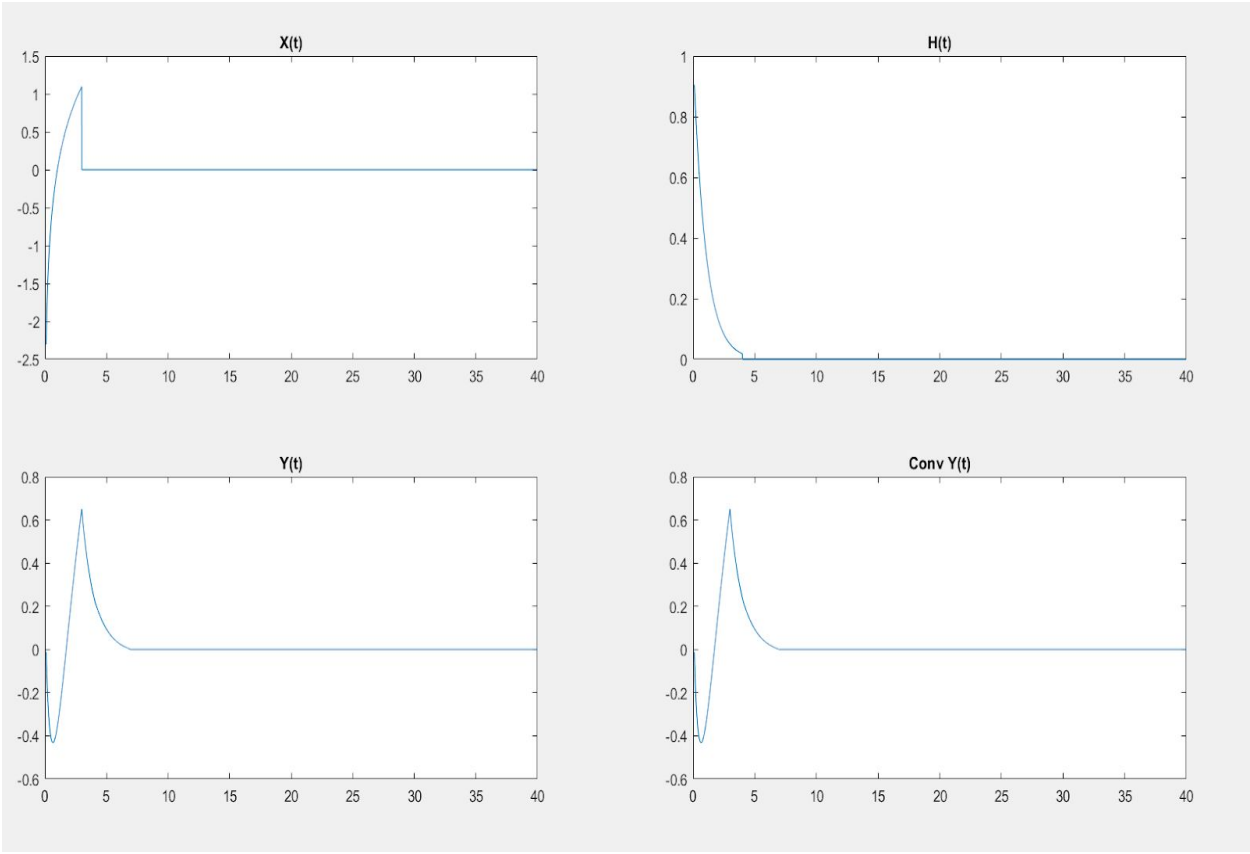
$$h(t) = \exp(-t)(u(t) - u(t-4))$$

Merge all the sections into a single pdf file and upload.

```
t=0.1:0.01:40;
x=log(t).*(u(t)-u(t-3));
h=exp(-1*t).*(u(t)-u(t-4));
T=0.1:0.01:40;
```

```
xT=zeros(size(T));
hT=zeros(size(T));
xT=log(T).*(u(T)-u(T-3));
hT=exp(-1*T).*(u(T)-u(T-4));
for i=1:length(t)
        k=t(i);
        %xT=log((k-T)).*(u(k-T)-u(k-T-3));
        hT=exp(-1*(k-T)).*(u((k-T))-u(k-T-4));
        y(i)=trapz(T,xT.*hT);
end
z=zeros(size(x)+size(h));
l=size(x)+size(h);
z=conv(x,h);
subplot(221);
plot(t,x);
title('X(t)');
subplot(222);
plot(t,h);
title('H(t)');
subplot(223);
plot(t,y);
title('Y(t)');
subplot(224);
plot(l,z);
title('Conv Y(t)');

function x = u(t)
x = zeros(size(t));
x(t>=0)=1;
end
```


X(t)
H(t)
Y(t)
Conv Y(t)