Practica 4: Convolución: Método Grafico

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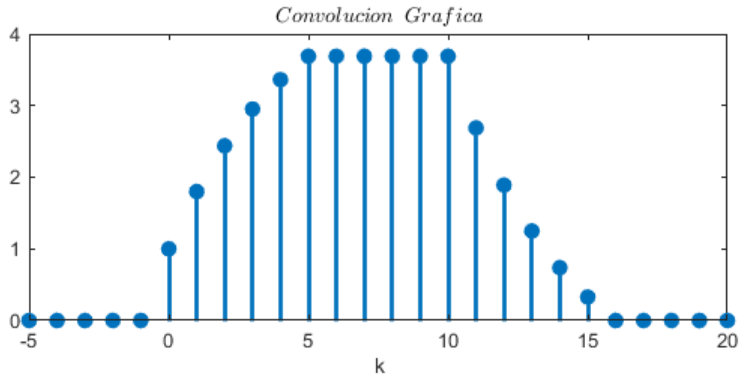
1. Utilice Matlab para calcular y graficar la convolución de las siguientes secuencias:

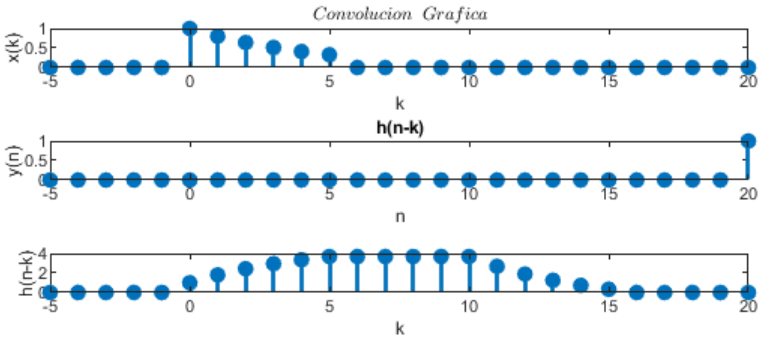
$$x(n) = \left(\frac{4}{5}\right)^{n}[u(n) - u(n-6)] \qquad h(n) = u(n) - u(n-11)$$



y =

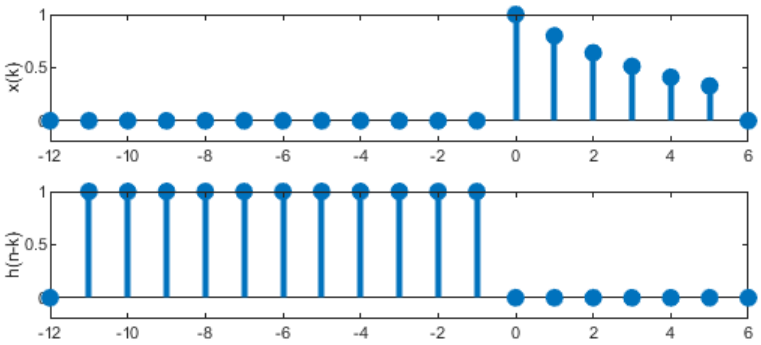
$$\left(1 \;\; \frac{9}{5} \;\; \frac{61}{25} \;\; \frac{369}{125} \;\; \frac{2101}{625} \;\; \frac{11529}{3125} \;\; \frac{11529}{3125} \;\; \frac{11529}{3125} \;\; \frac{11529}{3125} \;\; \frac{11529}{3125} \;\; \frac{11529}{3125} \;\; \frac{8404}{3125} \;\; \frac{5904}{3125} \;\; \frac{3904}{3125} \;\; \frac{2304}{3125} \;\; \frac{1024}{3125}\right)$$

2. Utilice Matlab para crear una animación que muestre el método grafico para calcular la convolución de las secuencias del inciso anterior

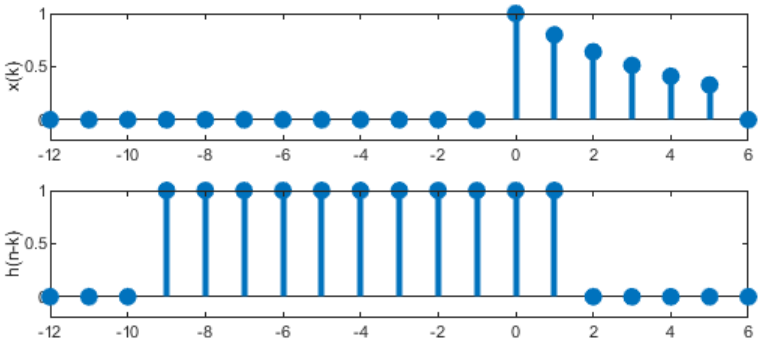


a. Grafique cada uno de los casos analizados en el método de convolución grafica.

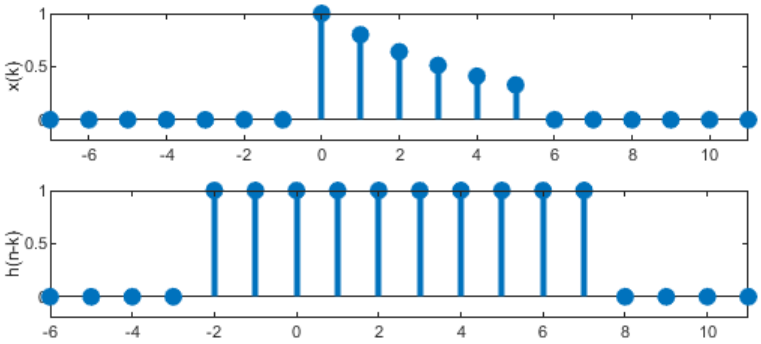
Caso (i) $n < 0$



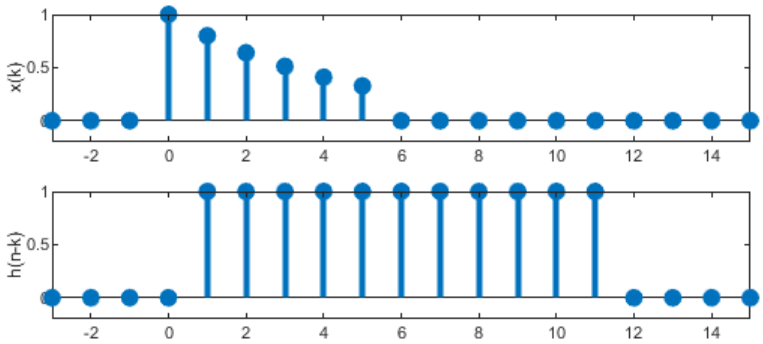
Caso (ii) $0 \leq n \leq 5$



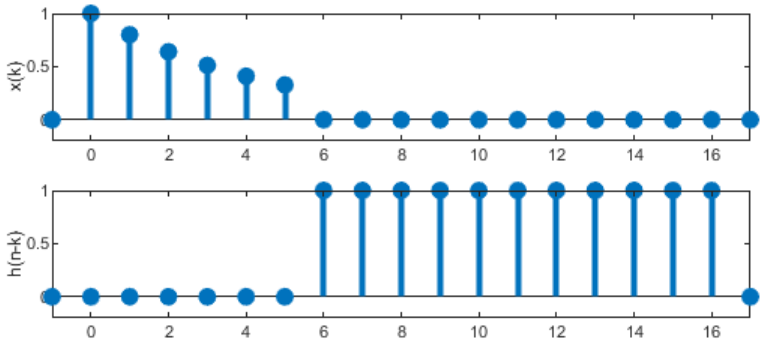
Caso (iii) $6 \leq n \leq 10$



Caso (iv) $11 \leq n \leq 15$



Caso (v) $n \geq 16$



Anexo de Código

```
%Ejercicio 1
escalon = @(n) n>=0;
n=-5:10;
figure('Position',[500 400 600 250])
y = conv((4/5).^n.*(escalon(n)-escalon(n-6)),escalon(n)-escalon(n-11));
n = -10:20;
stem(n,y,'filled','LineWidth',2)
title('$ Convolucion\hspace{.2cm}Grafica $','Interpreter','latex')
xlabel('k')
xlim([-5,20]);
y = sym(y(11:26))

%Ejercicio 2. simulacion
figure('Position',[500 400 600 250])
escalon = @(n) n>=0;
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n = -15:20;
x1 = @(n) (4/5).^n.*(escalon(n)-escalon(n-6));
h1 = @(n) escalon(n)-escalon(n-11);
yconv = zeros(1,36);
figure('Position',[500 400 600 250])
for k = n

    y =@(n) conv(x1(k),h1(n-k));
    yconv =+ yconv + y(n) ;
    subplot(311)
    stem(n,x1(n),'filled','LineWidth',2)
    title('$ Convolucion\hspace{.2cm}Grafica $','Interpreter','latex')
    xlabel('k')
    ylabel('x(k)')
    xlim([-5,20]);

    subplot(313)
    stem(n,yconv,'filled','LineWidth',2)
    xlabel('k')
    ylabel('h(n-k)')
    xlim([-5,20]);
    drawnow
    pause(0.1)

    subplot(312)
    stem(n,h1(n-k),'filled','LineWidth',2)
    title('h(n-k)')
    xlabel('n')
    ylabel('y(n)'),
    xlim([-5,20]);
    drawnow
    pause(0.1)
end

%Ejercicio 2. casos de la convolucion
%Caso 1
figure('Position',[500 400 600 250])
n=-12:6;
escalon = @(n) n>=0;
x = (4/5).^n.*(escalon(n)-escalon(n-6));
subplot(211)
stem(n,x,'filled','LineWidth',3)
ylabel('x(k)')
ylim([-.2 1])

subplot(212)
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```
h = zeros(1,33);
n=-12:20;
h = escalon(n+11)-escalon(n);
stem(n,h,'filled','LineWidth',3)
ylabel('h(n-k)')
xlim([-12 6]);
ylim([-.2 1])

%Caso 2
figure('Position',[500 400 600 250])
n=-12:6;
escalon = @(n) n>=0;
x = (4/5).^n.*(escalon(n)-escalon(n-6));
subplot(211)
stem(n,x,'filled','LineWidth',3)
ylabel('x(k)')
ylim([-.2 1])

subplot(212)
h = zeros(1,33);
n=-12:20;
h = escalon(n+9)-escalon(n-2);
stem(n,h,'filled','LineWidth',3)
ylabel('h(n-k)')
xlim([-12 6]);
ylim([-.2 1])

%Caso 3
figure('Position',[500 400 600 250])
n=-12:11;
escalon = @(n) n>=0;
x = zeros(20);
x = (4/5).^n.*(escalon(n)-escalon(n-6));
subplot(211)
stem(n,x,'filled','LineWidth',3)
ylabel('x(k)')
xlim([-7 11]);
ylim([-.2 1])

subplot(212)
h = zeros(1,33);
n=-12:20;
h = escalon(n+2)-escalon(n-8);
stem(n,h,'filled','LineWidth',3)
ylabel('h(n-k)')
xlim([-6 11]);
```

```
ylim([-.2 1])

%Caso 4
figure('Position',[500 400 600 250])
n=-3:15;
escalon = @(n) n>=0;
x = zeros(20);
x = (4/5).^n.*(escalon(n)-escalon(n-6));
subplot(211)
stem(n,x,'filled','LineWidth',3)
ylabel('x(k)')
xlim([-3 15]);
ylim([-.2 1])

subplot(212)
h = zeros(1,33);
n=-12:20;
h = escalon(n-1)-escalon(n-12);
stem(n,h,'filled','LineWidth',3)
ylabel('h(n-k)')
xlim([-3 15]);
ylim([-.2 1])

%Caso 5
figure('Position',[500 400 600 250])
n=-3:17;
escalon = @(n) n>=0;
x = zeros(20);
x = (4/5).^n.*(escalon(n)-escalon(n-6));
subplot(211)
stem(n,x,'filled','LineWidth',3)
ylabel('x(k)')
xlim([-1 17]);
ylim([-.2 1])

subplot(212)
h = zeros(1,33);
n=-12:20;
h = escalon(n-6)-escalon(n-17);
stem(n,h,'filled','LineWidth',3)
ylabel('h(n-k)')
xlim([-1 17]);
ylim([-.2 1])
```