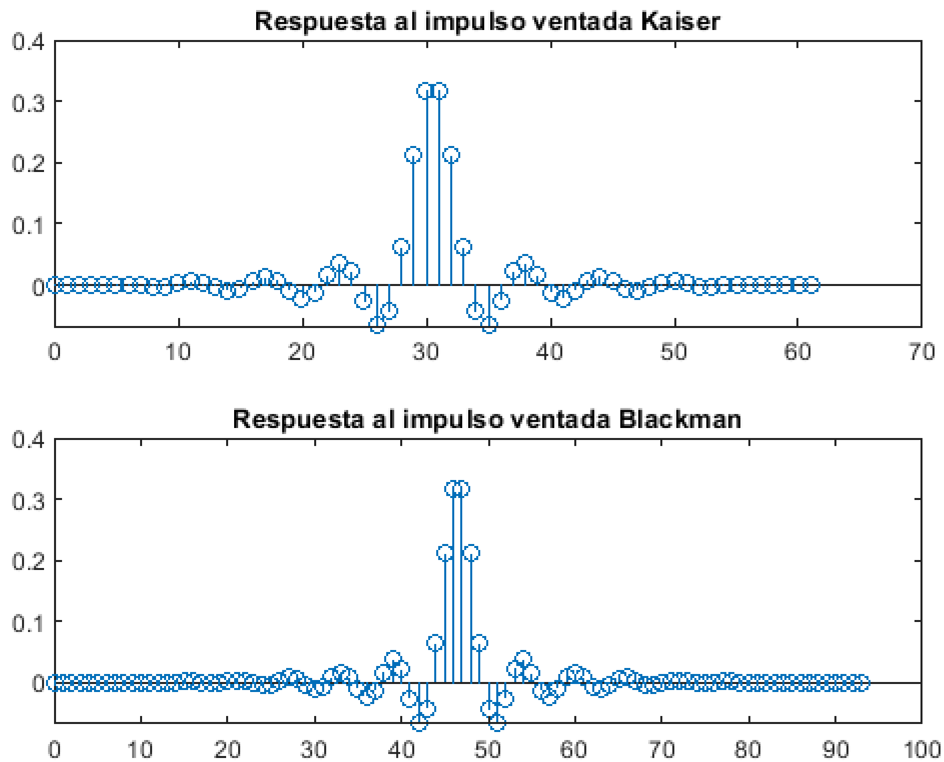
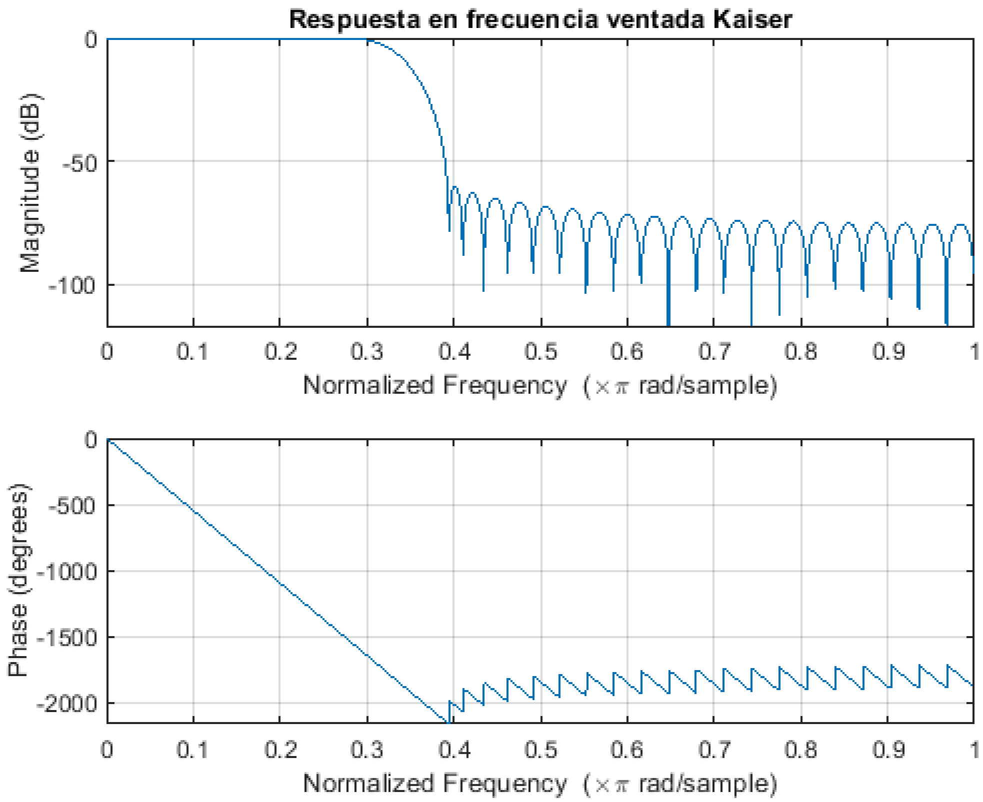
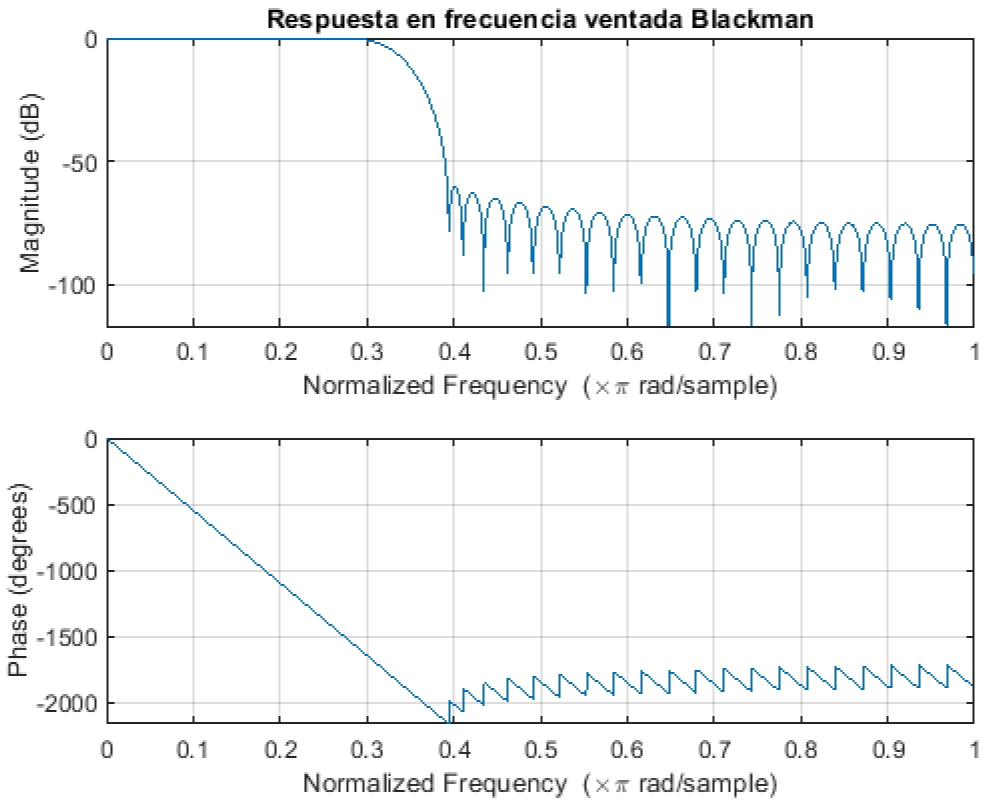
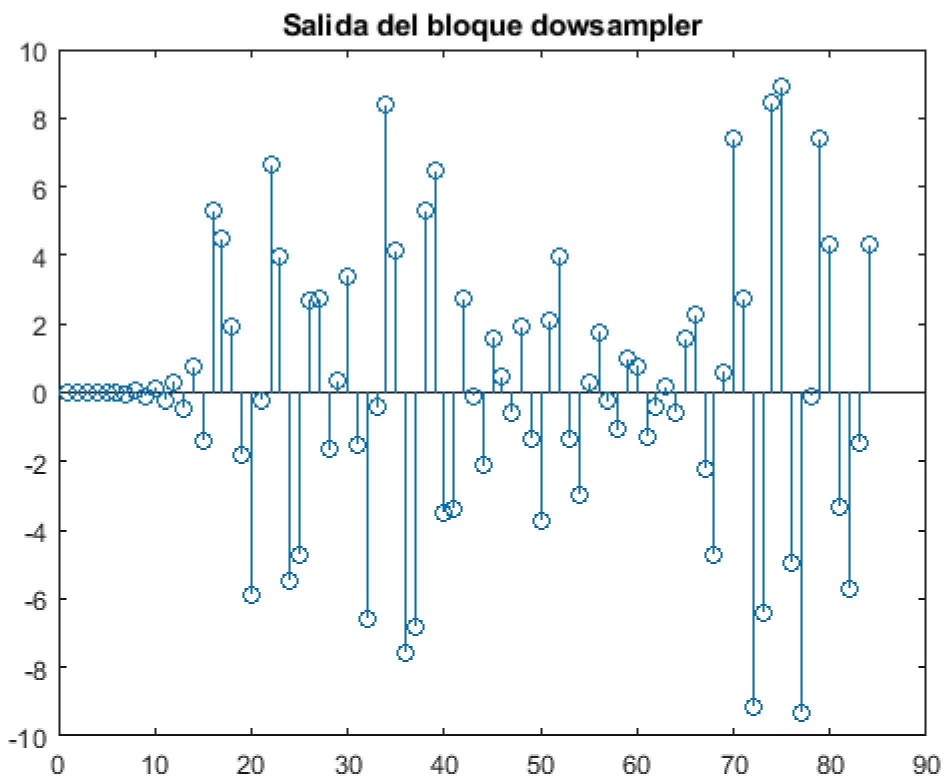
```
clear;clc;close all;
rng(212)

Lx = 250;
n = 0:(Lx-1);
Omega_0 = ((0.35-0.1)*pi).*rand(1,1) + 0.1*pi; % Valor aleatorio
 uniforme en [0.1 0.35]*pi.
K = 25;
x = PassBandSig_4_DSP(Lx,Omega_0,K);


xn = x;
Omegac = pi*(1/3);

%Ventana de
 Kaiser//////////////////////////////////////////////////////////////
h_k = fir1(61,Omegac/pi,kaiser(62,5.6538));
figure(1);subplot(211);stem(0:61,h_k);
title("Respuesta al impulso ventada Kaiser");

h_VentFija = fir1(93,Omegac/pi,blackman(94));
subplot(212);stem(0:93,h_VentFija);
title("Respuesta al impulso ventada Blackman");

figure(2);
freqz(h_k,1,1024);
title("Respuesta en frecuencia ventada Kaiser");
figure(3);
freqz(h_k,1,1024);
title("Respuesta en frecuencia ventada Blackman");

%BLOQUE DOWN-SAMPLING
rn = filter(h_VentFija,1, xn); % Salida del filtro
M = 3; % Factor de downsampling.
ydn = downsample(rn,M); % Salida del downsampler.
figure(4);stem(ydn);title("Salida del bloque dowsampler");

% ** Cálculo y representación de los espectros ****

% *** señal de entrada ******
    [Sxn,Fxn] = PSD_periodogram(xn);
    figure(5);subplot(311);plot(Fxn,Sxn);title("Señal de entrada");
    [Srn,Fyun] = PSD_periodogram(rn);
    subplot(312);plot(Fyun,Srn);title("Señal tras dowsample");

    % *** Señal de salida ******
    [Sydn,Fyn] = PSD_periodogram(ydn);
    subplot(313);plot(Fyn,Sydn);title("Señal de salida");


function [Sx,F] = PSD_periodogram(x)
% This function determines the power spectral density (PSD)
```

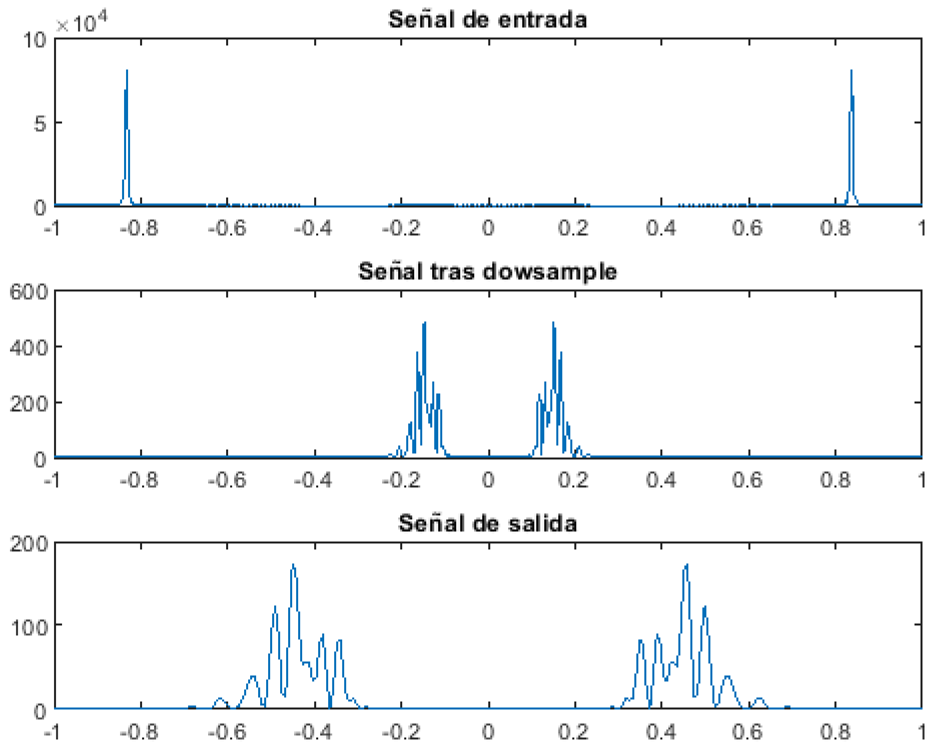
```
% function of a signal x using the periodogram.
%
% Incoming parameters:
% - x: signal from which the PSD is to be determined.
%
% Outgoing parameters:
% - Sx: PSD function.
% - F: normalized frequency in the interval [-1,1]
% corresponding to the digital frequency interval [-pi,pi].
L = length(x);
N = min([2^ceil(log2(L)+1) 2048]);
Sx = abs(fftshift(fft(x,N))).^2/L;
F = linspace(-1,1,size(Sx,2));
end

function [x] = PassBandSig_4_DSP(L,Omega_0,K)
    n = 0:(L-1);
    x=cos(Omega_0*n);
    alphaK=(0.02)*randn(1,1);
    Omega_A = (5*pi)/6;
    for k=1:K
        sigma_k=(1+(k/25))^-1;
        A1=sigma_k*randn(1,1);
        A2=sigma_k*randn(1,1);
        Phi1=rand*(2*pi-pi);
        Phi2=rand*(2*pi-pi);
        Omega_K=Omega_0*(1+(alphaK*k));
        x1=cos((Omega_K*n)+Phi1);
        x2=cos((((Omega_0)^2)/Omega_K)*n)+Phi2);
        x=x+A1*x1+A2*x2+1.5*cos(Omega_A*n);
    end
end
```


Respuesta al impulso ventada Kaiser
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
70
Respuesta al impulso ventada Blackman
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
70
80
90
100


Respuesta en frecuencia ventada Kaiser
Magnitude (dB)
0
-50
-100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Normalized Frequency (×π rad/sample)
Phase (degrees)
0
-500
-1000
-1500
-2000
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Normalized Frequency (×π rad/sample)


Respuesta en frecuencia ventada Blackman
Magnitude (dB)
Normalized Frequency (×π rad/sample)
Phase (degrees)
Normalized Frequency (×π rad/sample)


Salida del bloque dowsampler



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