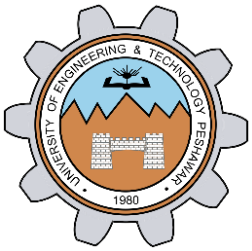
DESIGNING FIR FILTERS

LAB # 10



CSE402L Digital Signal Processing Lab

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Registration No: **18PWCSE1658**

Class Section: **B**

"On my honor, as a student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Student Signature: _____

Submitted to: **Engr. Faiz Ullah**

Friday, February 26th, 2021

Department of Computer Systems Engineering

University of Engineering and Technology, Peshawar

Practical:

Using the FDATool of MATLAB, obtain the coefficients of 3rd order, 7th order and 10th order FIR low pass filter with a cutoff frequency of 4000 Hz, sampled at 8000 Hz. Perform the procedure for rectangular, hamming, hann, Barlett, Flat Top and Kaiser Windows. Generate a signal composed of three sinusoids of 10, 20 and 50 Hz and contaminate the signal with noise. Using the above filters, eliminate the noise. Draw time and frequency domain plots of the signals.

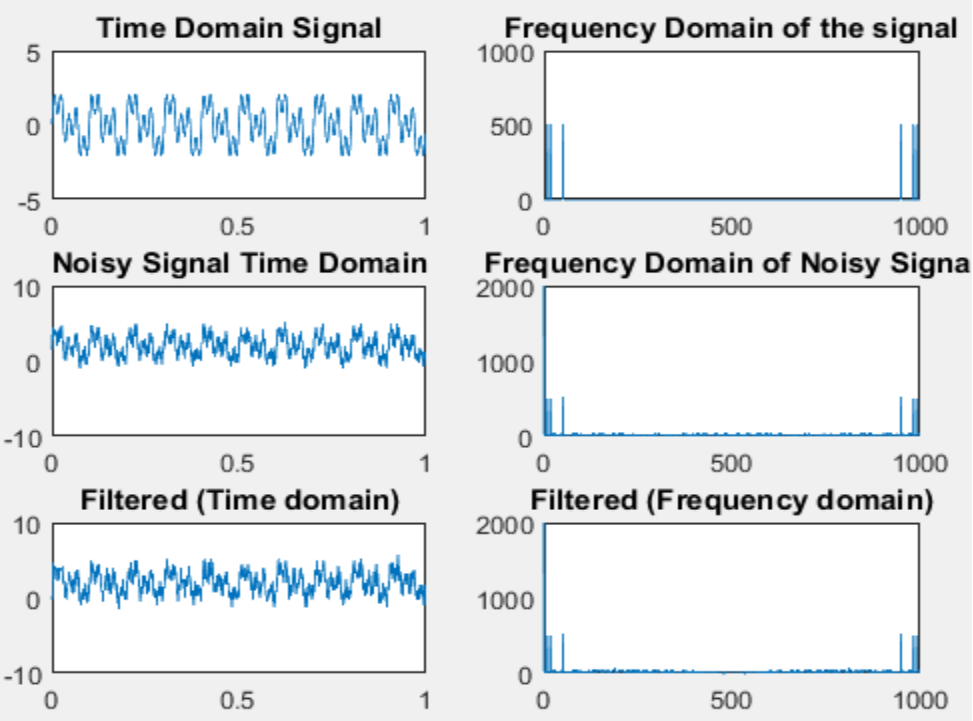
Code:

```
fs = 1000;
N = 1000;
t = (0:N-1)/fs;
x1 = sin(2*pi*10*t);
x2 = sin(2*pi*20*t);
x3 = sin(2*pi*50*t);
x = x1+x2+x3;
noise = 1+2*rand(size(t));
xN = x+noise;
xk = fft(x);
xNk = fft(xN);
f = ((0:N-1)*fs)/N;
subplot(3,2,1)
plot(t,x);
title('Time Domain Signal');
subplot(3,2,2)
plot(f,abs(xk));
title('Frequency Domain of the signal');
subplot(3,2,3)
plot(t,xN);
title('Noisy Signal Time Domain');
subplot(3,2,4)
plot(f,abs(xNk));
title('Frequency Domain of Noisy Signal');
y = filter(Num,1,xN);
yk = fft(y);
subplot(3,2,5)
plot(t,y);
title('Filtered (Time domain)');
subplot(3,2,6)
plot(f,abs(yk));
title('Filtered (Frequency domain)');
```

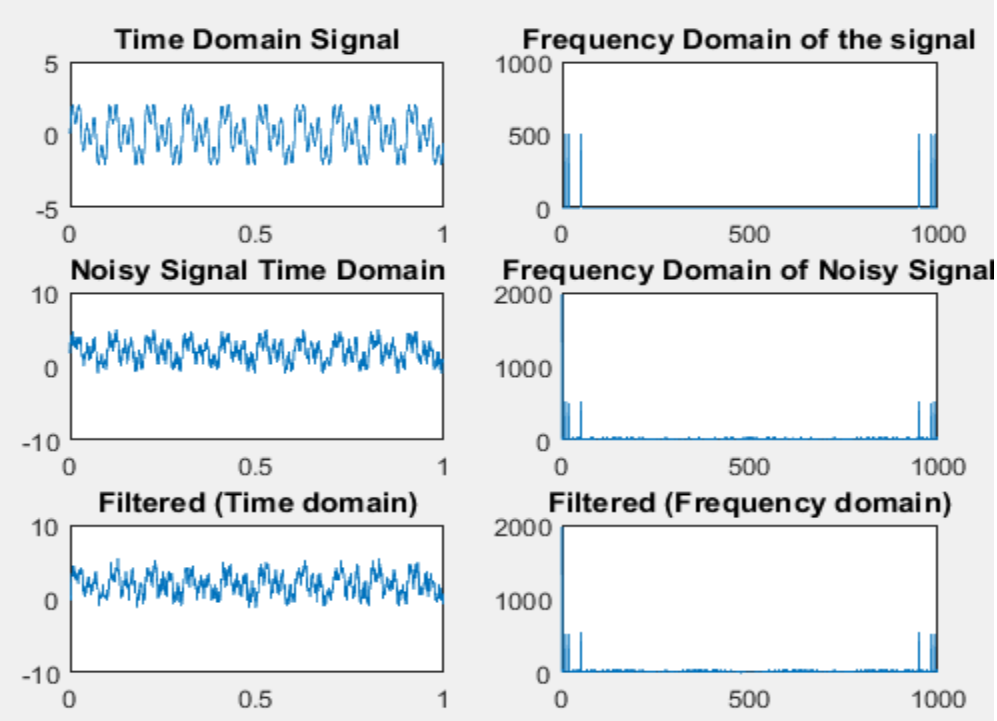
Output:

Rectangular:

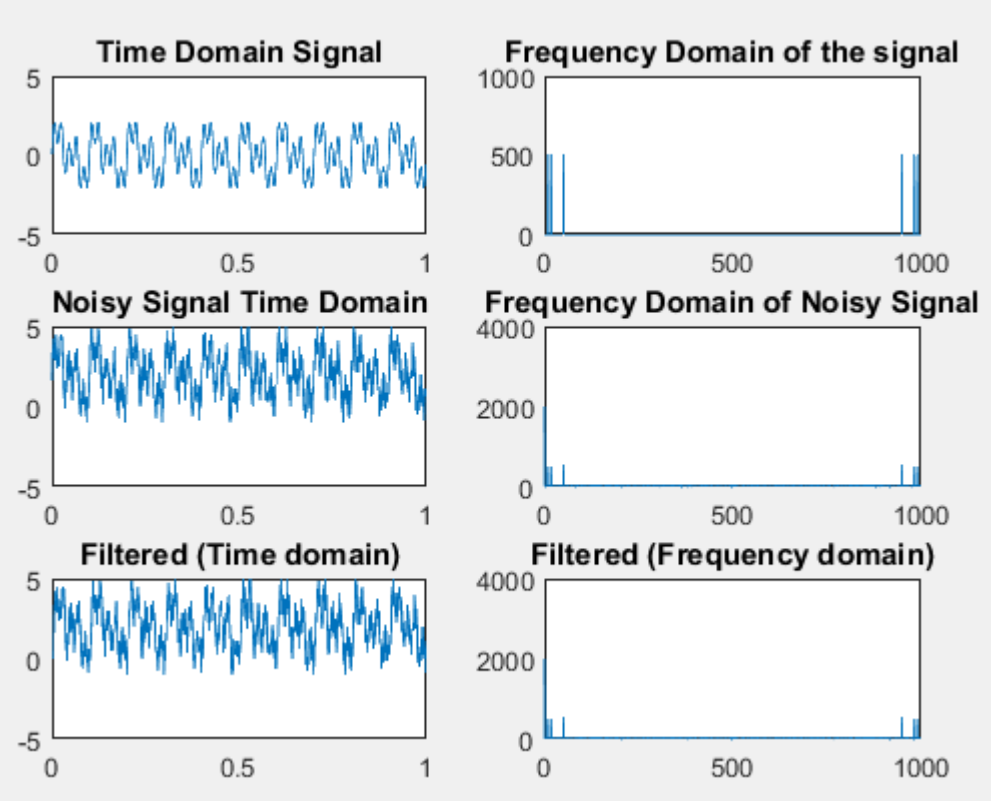
Order 3:



Order 7:

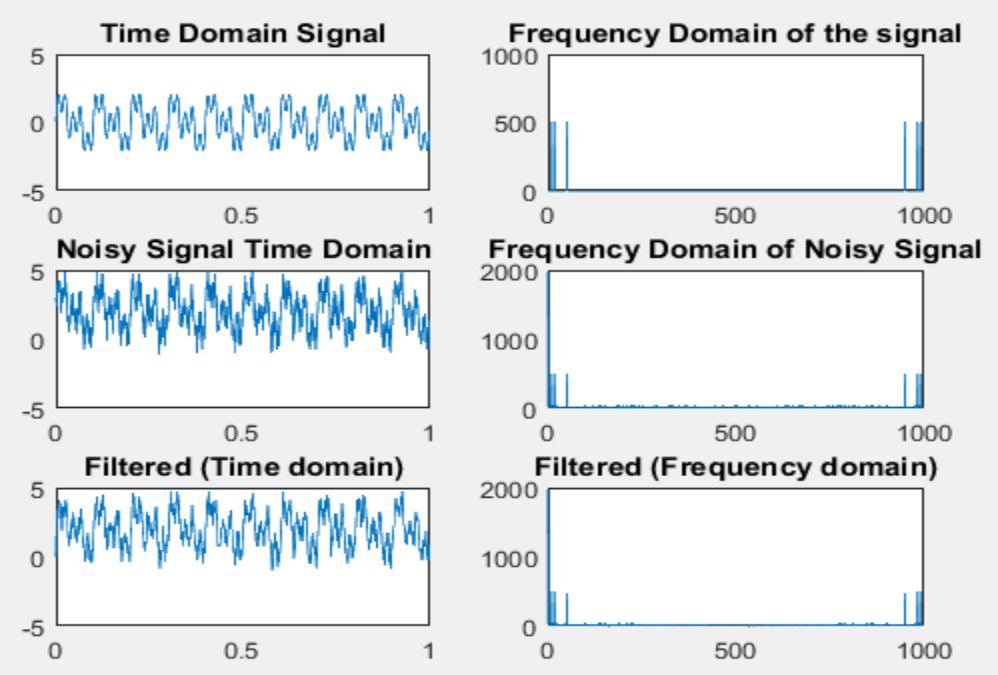


Order 10:



Hamming:

Order 3:



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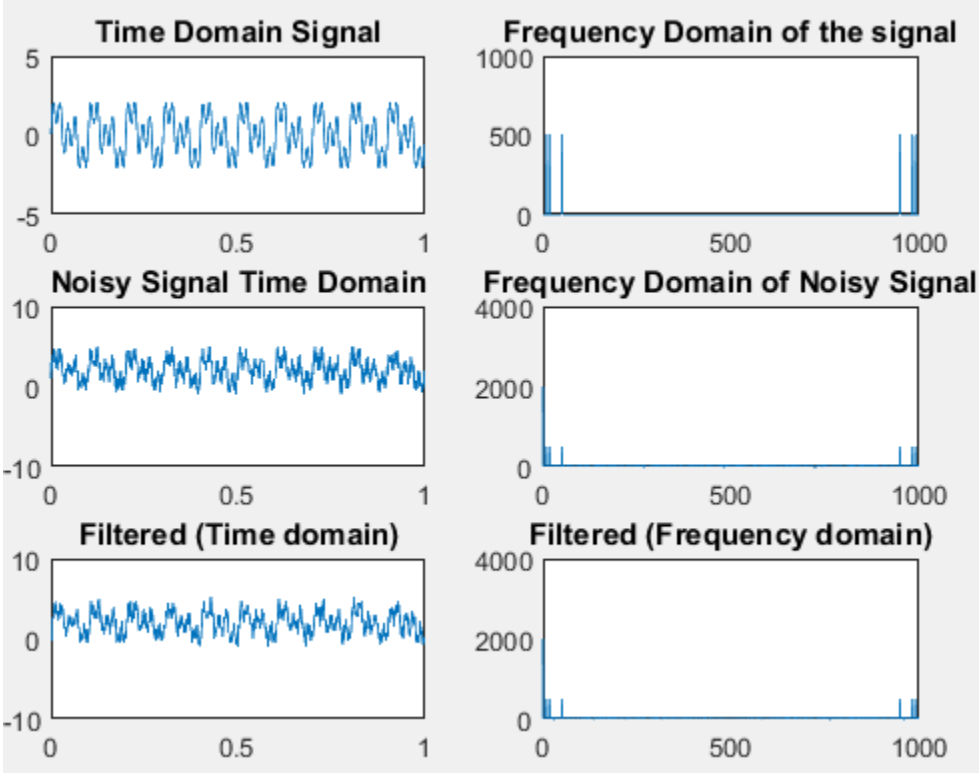

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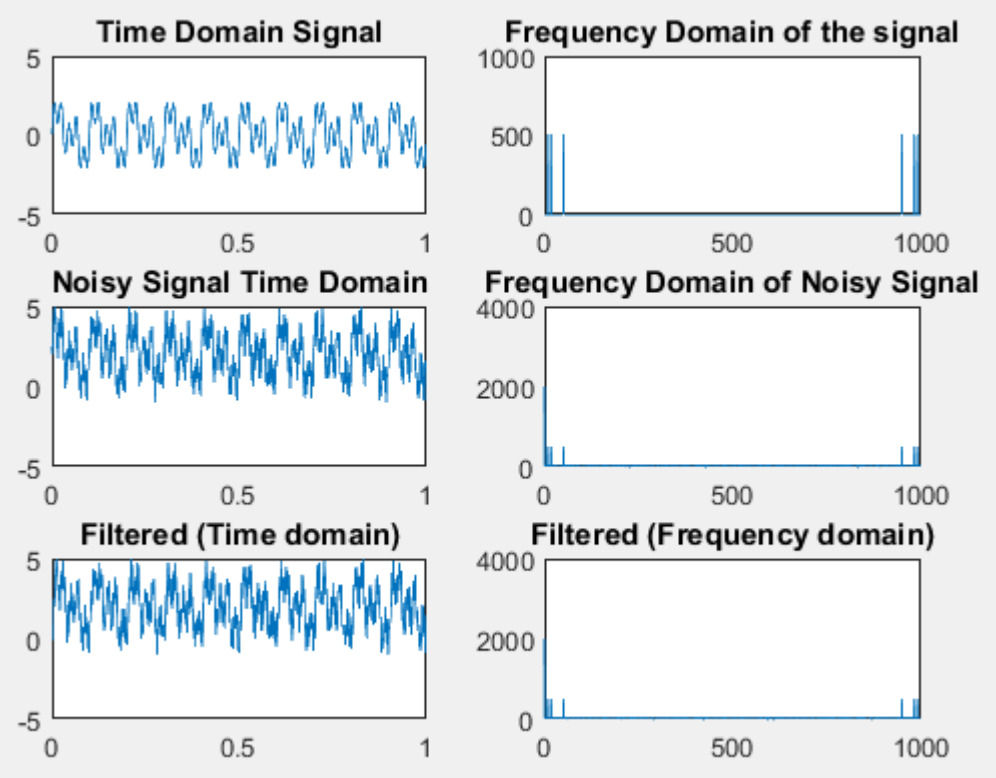
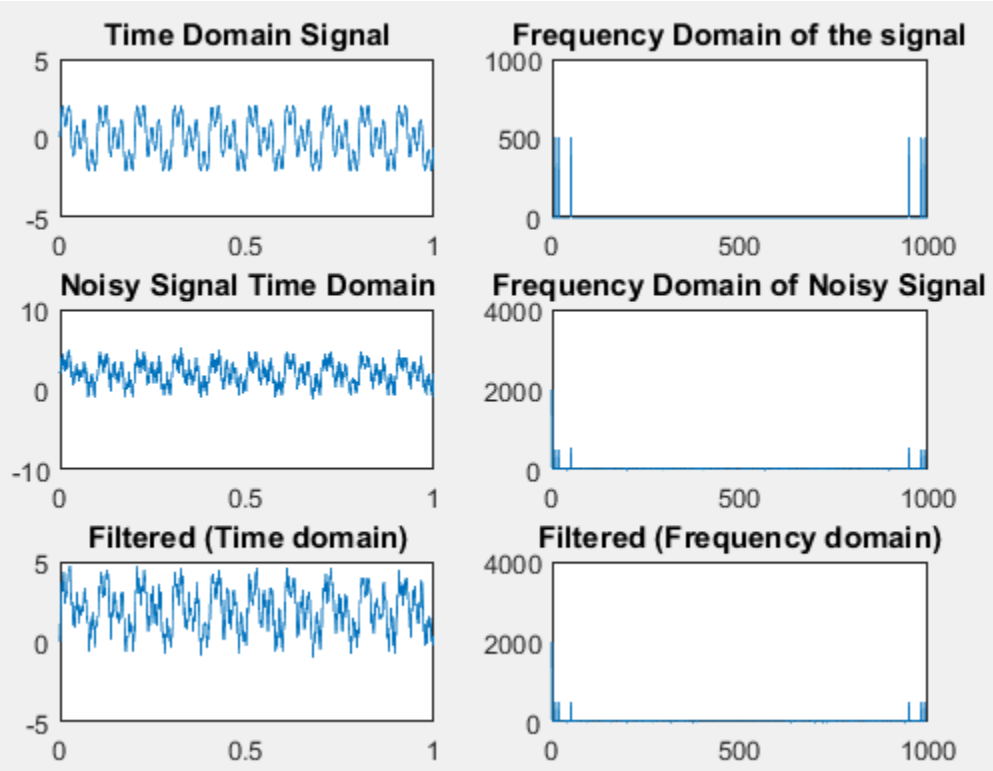


Hann:

Order 3:



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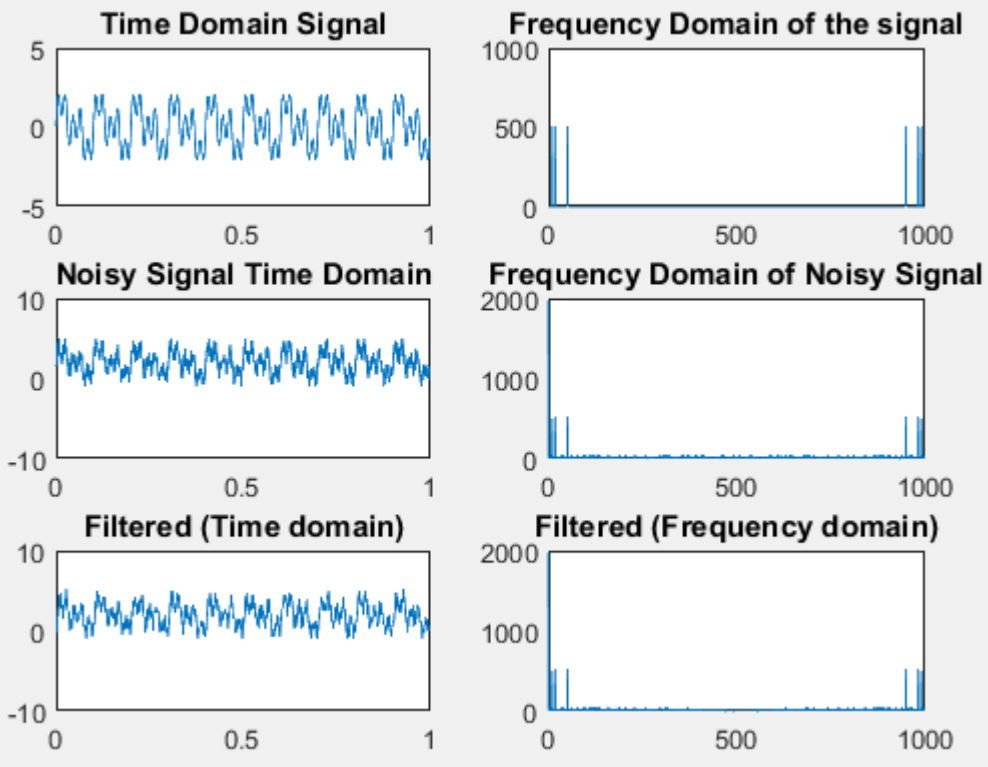

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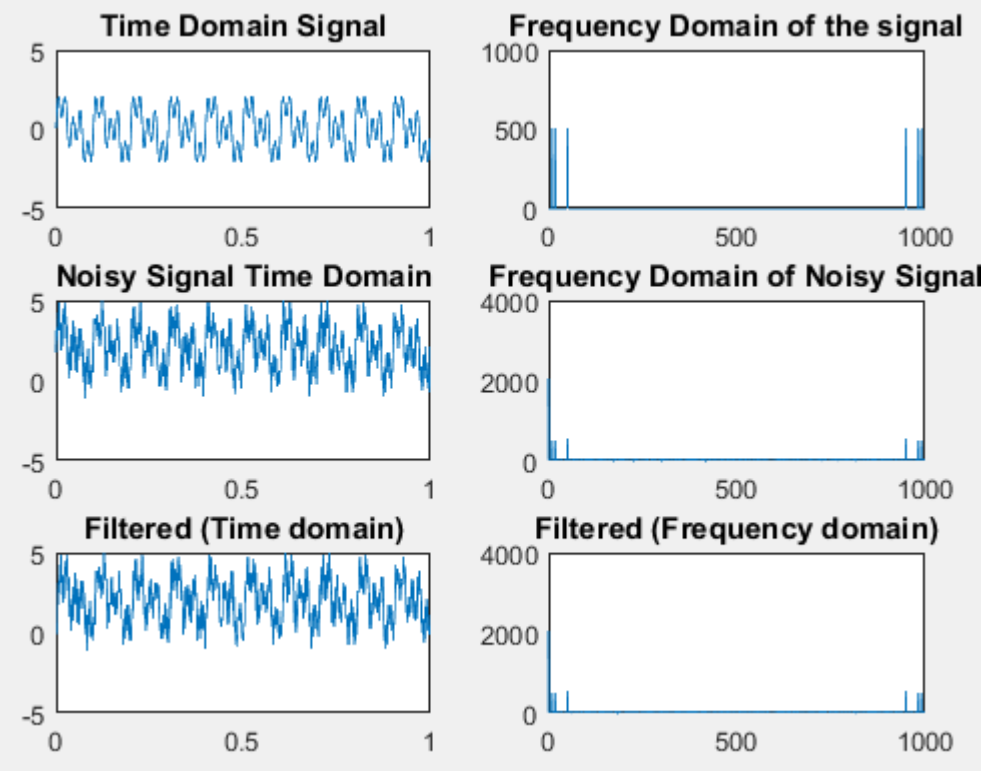
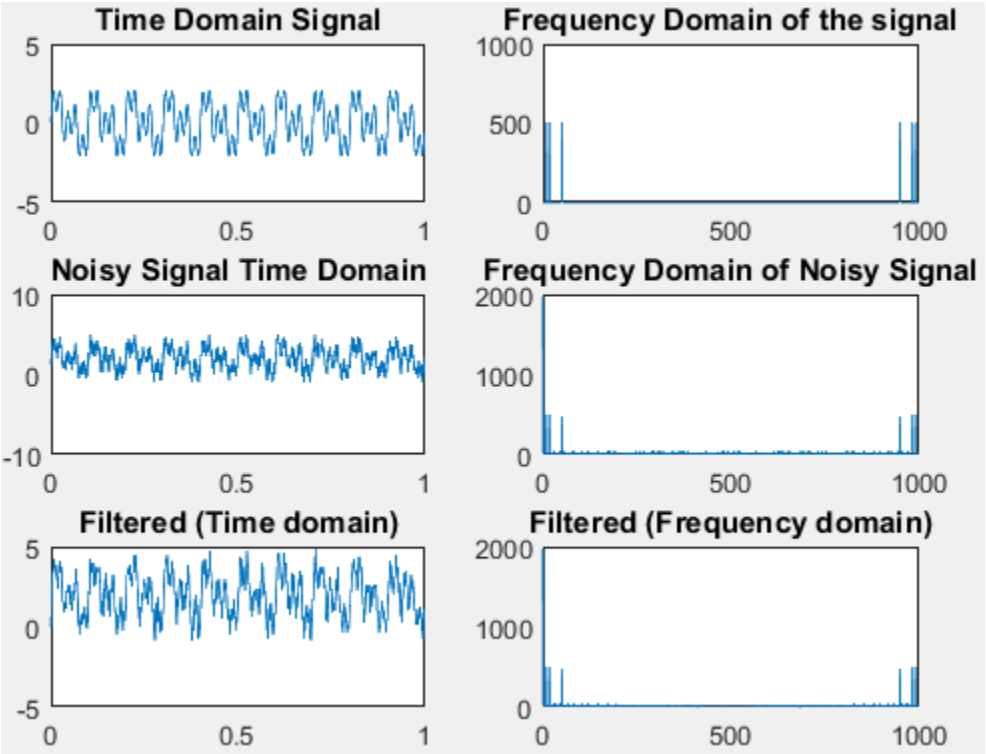


Bartlett:

Order 3:



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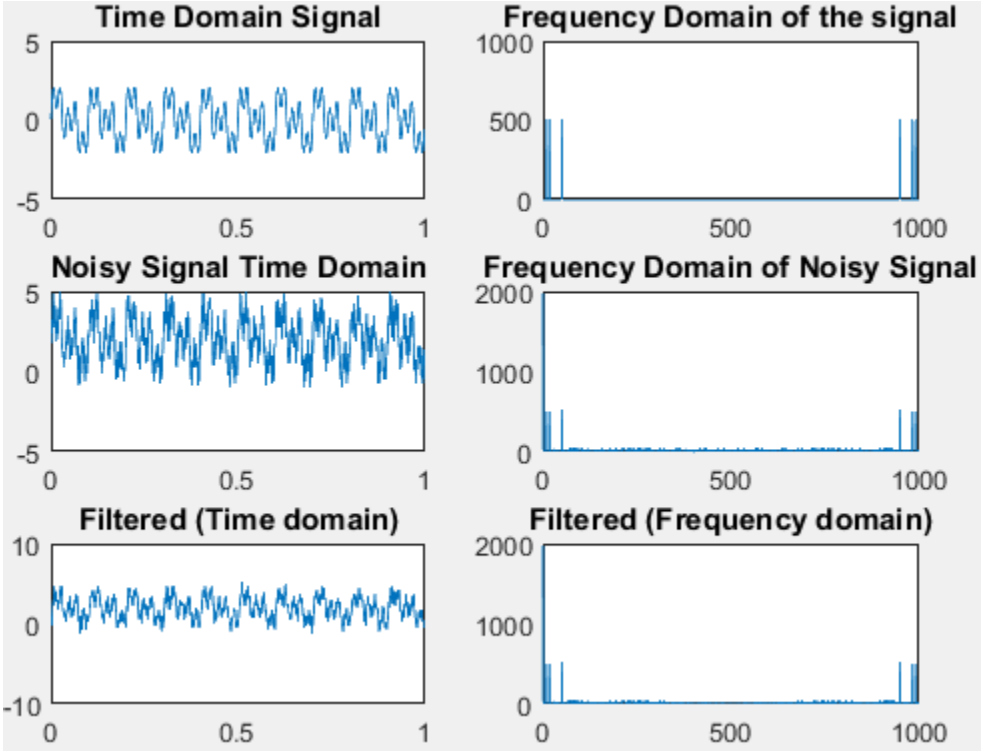
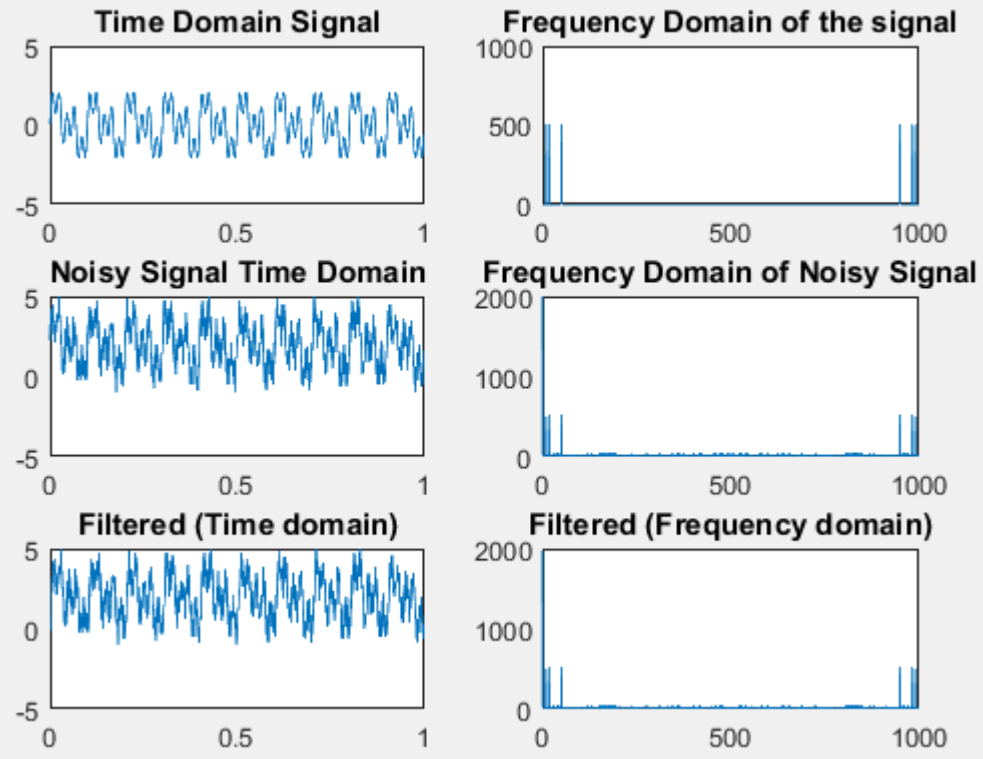
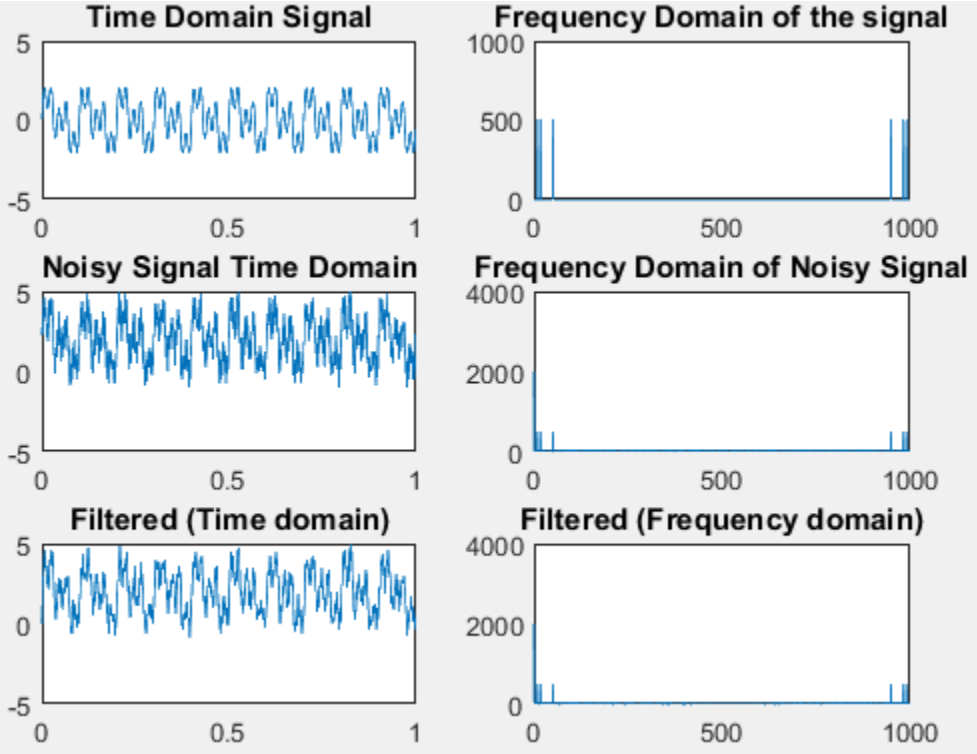


Order 10:



Flat Top:

Order 3:



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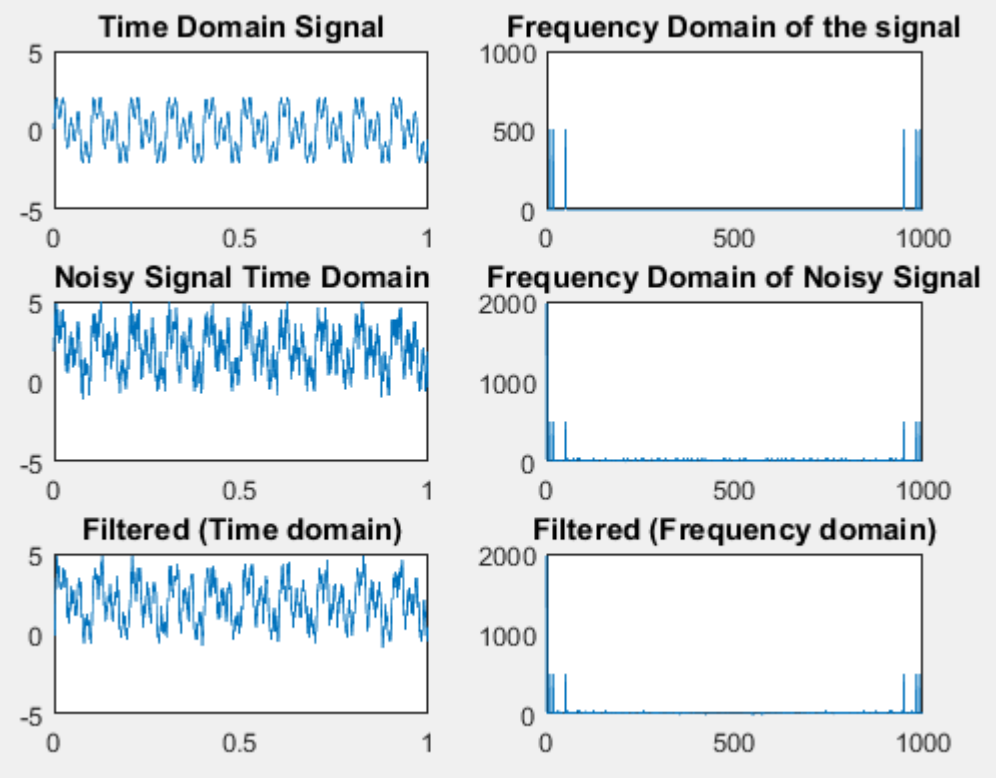

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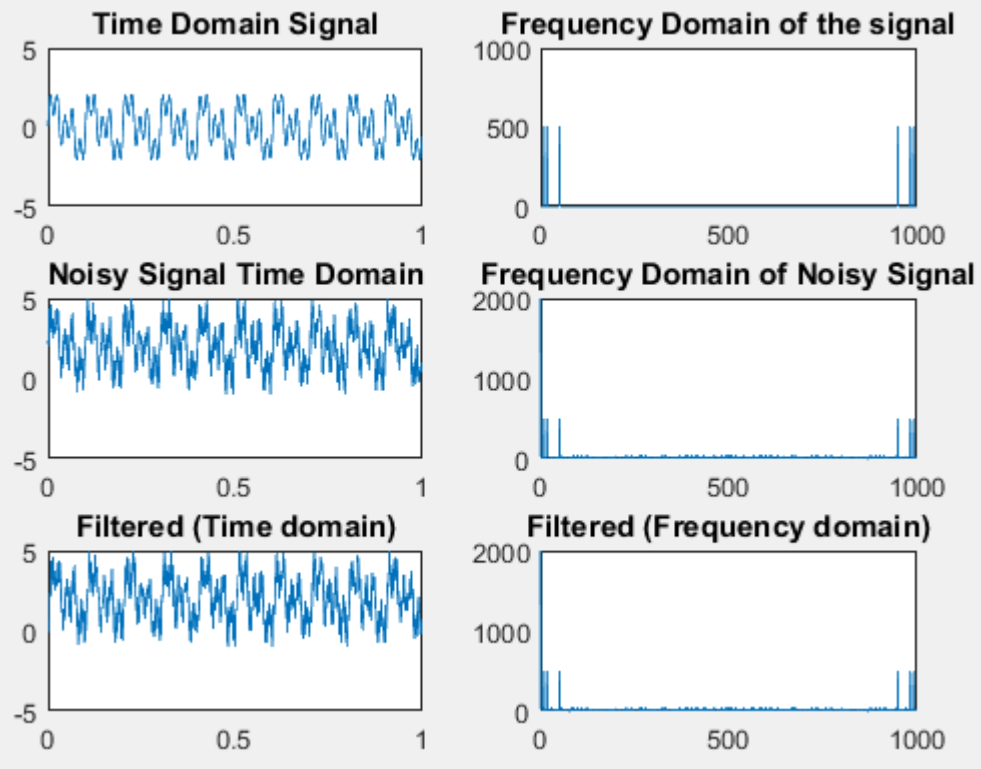
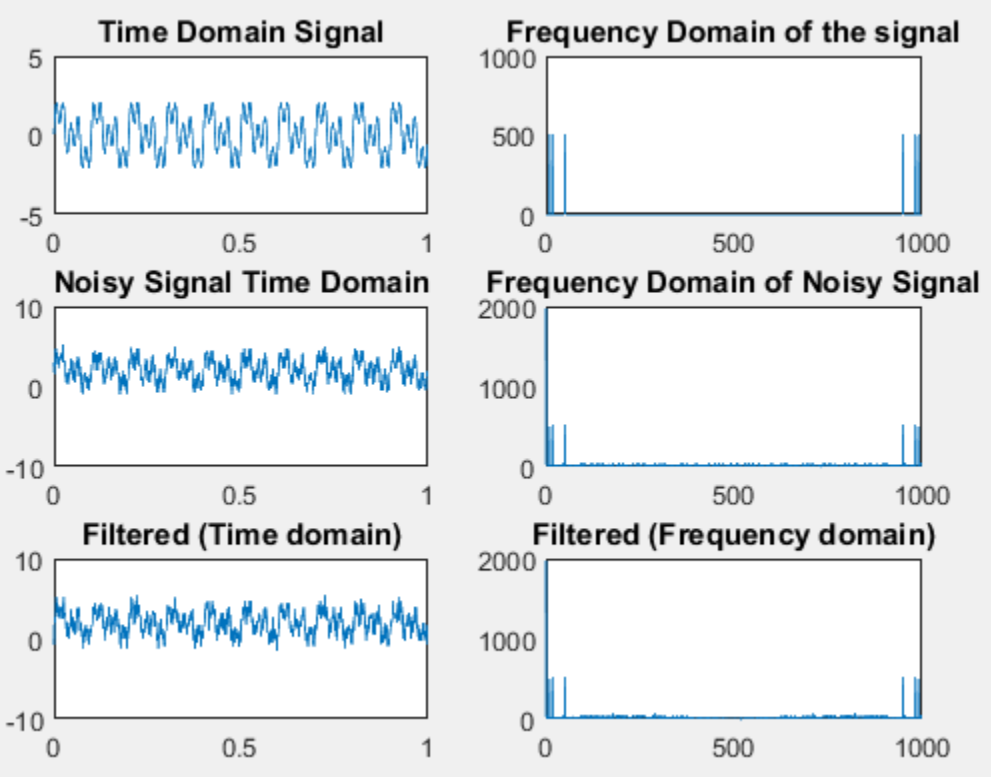


Kaiser:

Order 3:



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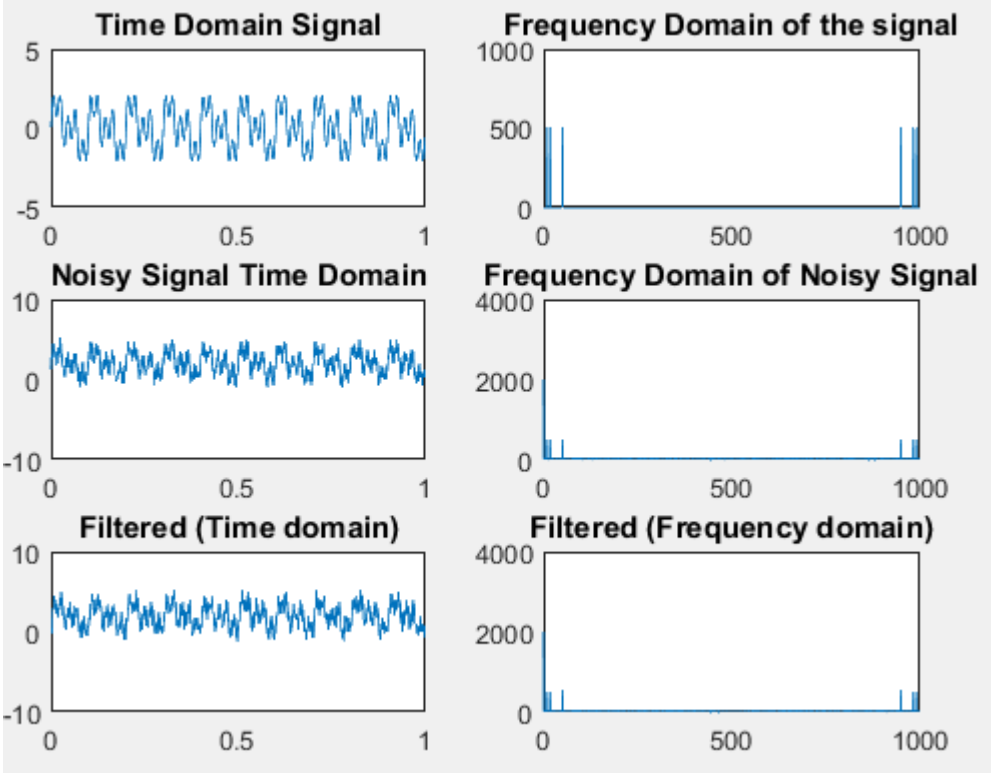

Order 10: