Lab Report No 5



Digital Signal Processing

Submitted By:

Registration No:

Section:

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

Student Signature:

Department of Computer Systems Engineering

University of Engineering and Technology Peshawar

**CSE 402L: Digital Signal Processing**

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| --- | --- | --- | --- | --- |
| **Demonstration of Concepts** | **Poor (Does not meet expectation (1))**  The student failed to demonstrate a clear understanding of the assignment concepts | **Fair (Meet Expectation (2-3))**  The student demonstrated a clear understanding of some of the assignment concepts | **Good (Exceeds Expectation (4-5)**  The student demonstrated a clear understanding of the assignment concepts | **Score**  **30%** |
| **Accuracy** | The student completed ( <50%) tasks and provided MATLAB code and/or Simulink models with errors. Outputs shown are not correct in form of graphs (no labels) and/or tables along with incorrect analysis or remarks. | The student completed partial tasks (50% - <90%) with accurate MATLAB code and/or Simulink models. Correct outputs are shown in form of graphs (without labels) and/or tables along with correct analysis or remarks. | The student completed all required tasks (90%-100%) with accurate MATLAB code and/or Simulink models. Correct outputs are shown in form of labeled graphs and/or tables along with correct analysis or remarks. | **30%** |
| **Following Directions** | The student clearly failed to follow the verbal and written instructions to successfully complete the lab | The student failed to follow the some of the verbal and written instructions to successfully complete all requirements of the lab | The student followed the verbal and written instructions to successfully complete requirements of the lab | **20%** |
| **Time Utilization** | The student failed to complete even part of the lab in the allotted amount of time | The student failed to complete the entire lab in the allotted amount of time | The student completed the lab in its entirety in the allotted amount of time | **20%** |

Lab No: 5.

## Title: Spectral Analysis of a random signal using Matlab

Provide .m file with detailed comments

Hint: Find Power Spectral Density,  a measurement of the energy at various frequencies,

Procedure:

1. First create some data. Consider data sampled at 1000 samples/sec. Start by forming a time axis for the data, running from t=0 until t=.25 in steps of 1 millisecond. Then form a signal, x, containing sine waves at 50 Hz and 120 Hz.

(Hint: x = sin(2\*pi\*50\*t) + sin(2\*pi\*120\*t);)



1. Add some random noise with a standard deviation of 2 to produce a noisy signal y. Take a look at this noisy signal y by plotting it. (Hint: y = x + randn(size(t));)



Figure 1: Noisy Time Domain Signal

1. Finding the discrete Fourier transform of the noisy signal y (Hint: Y = fft(y,251);)



1. Compute the power spectral density, a measurement of the energy at various frequencies, using the complex conjugate (CONJ). Form a frequency axis for the first 127 points and use it to plot the result.  (Hint: Pyy = Y.\*conj(Y)/251; f = 1000/251\*(0:127);)



1. Compute and plot the periodogram using periodogram. Show that the two results are identical.

[Pyy2,w] = periodogram(y,rectwin(length(y)),length(y),1000)

figure;

plot(w,10\*log10(Pyy2))



1. Zoom in and plot only up to 200 Hz. Notice the peaks at 50 Hz and 120 Hz. These are the frequencies of the original signal. ( Hint: plot(f(1:50),Pyy(1:50))



1. Final Remarks/Conclusion.