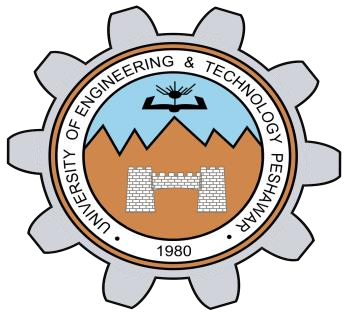
**Lab report 04**



**CSE 402L**

**Digital Signal Processing Fall 2024**

**Submitted by: Naveed Ahmad**

**Registration No.: 22PWCSE2165**

**Class Section: B**

**Semester :5th**

*“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: \_\_\_\_\_\_\_\_\_\_\_\_

Submitted to:

**Dr. Yasir Saleem Afridi**

Nov. 25, 2024

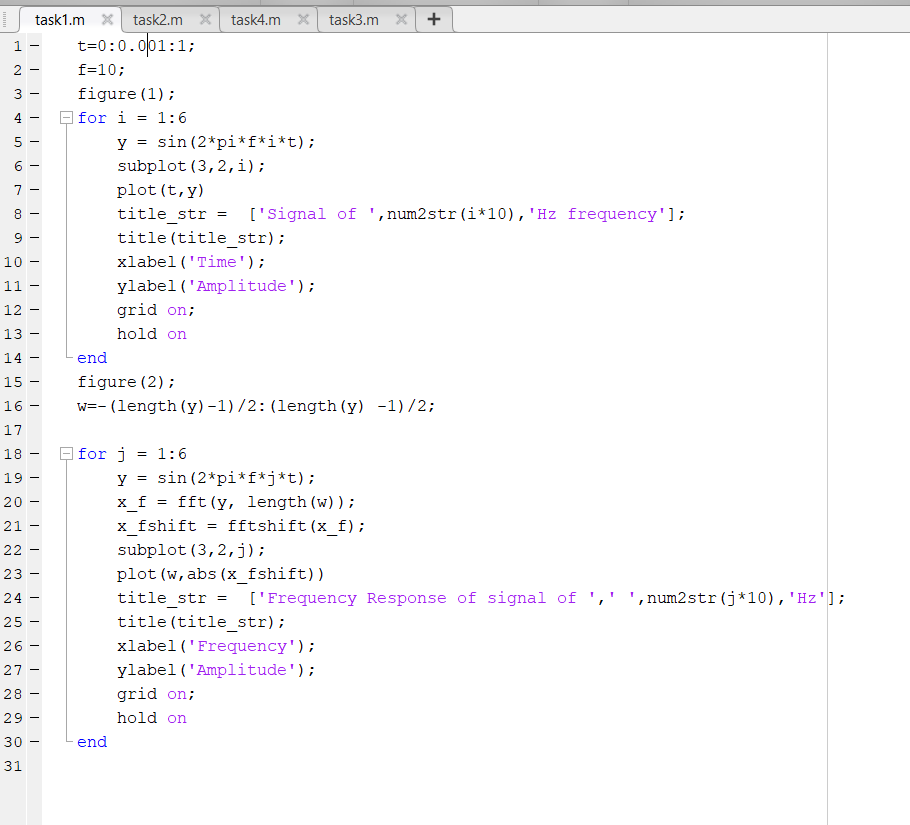
Department of Computer Systems Engineering

University of Engineering and Technology Peshawar

Task:

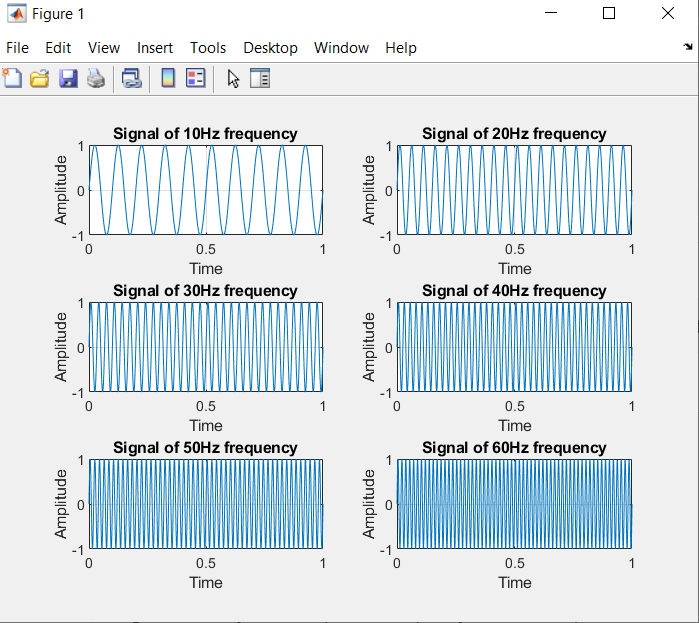
Will generate the signal of different frequencies say , 10,20,30,40,50,60 Hz (one second duration) using Matlab as shown in figure 1 and transform the same signal in frequency domain using Fourier transform and will compare the frequencies with the time domain signal as shown in figure 2.

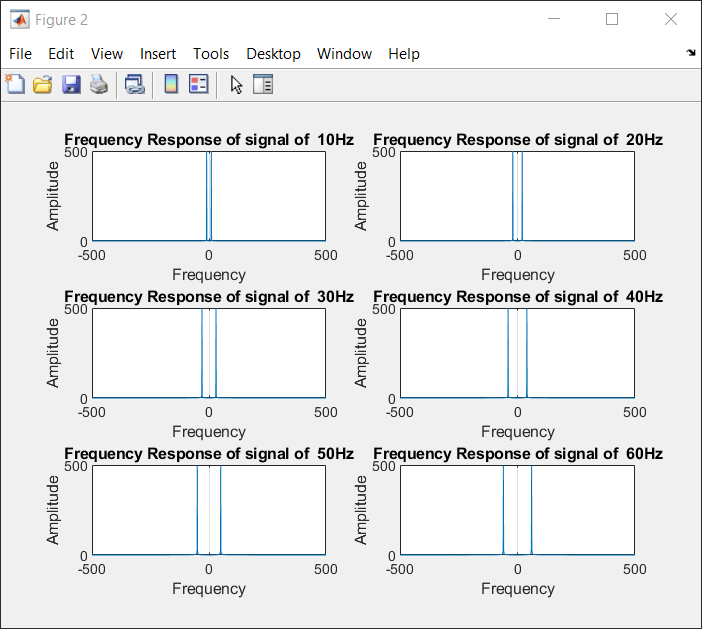
Code:



* Time vector t defined, representing time from 0 to 1.
* Base frequency f set as 10 Hz.
* Figure 1 displays sine waves of increasing frequencies.
* Each subplot shows a signal's time-domain representation.
* Figure 2 analyzes and plots frequency-domain responses.
* Frequency vector w defined for FFT centering.
* FFT calculates and plots signal magnitude spectrums.

Output:

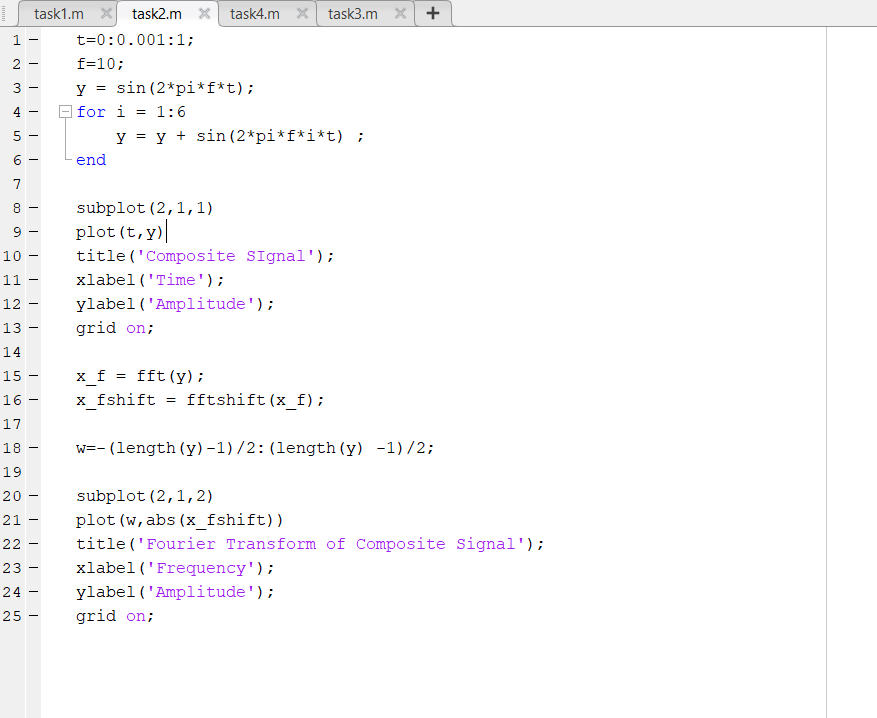




Task 02:

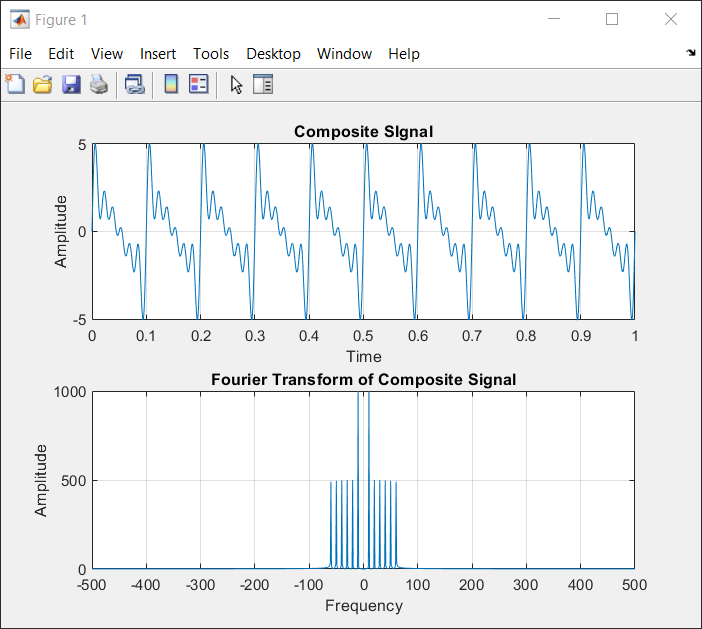
* **Compare** the Figures 1 and 2 (Generated by your code)
* Add all the signals generated in step 1 and get a composite signal. (which may be considered as a voice signal)
* Plot the time and frequency domain representation of the composite signal as shown in Figure 3

Code:



* Time vector t defined from 0 to 1 with 0.001 step size.
* Base frequency f set as 10 Hz.
* Initial sine wave y defined for base frequency.
* Loop adds harmonics to create a composite signal.
* First subplot plots the composite signal in the time domain.
* Title, labels, and grid added for clarity.
* FFT applied to composite signal to analyze frequency domain.
* Frequency vector w defined for centered spectrum.
* Second subplot plots magnitude of Fourier Transform.

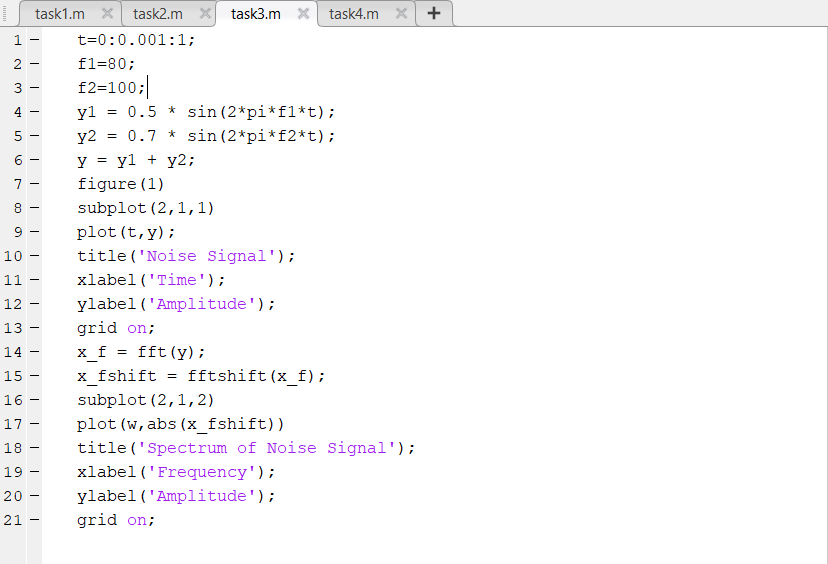
Output:



Task 03:

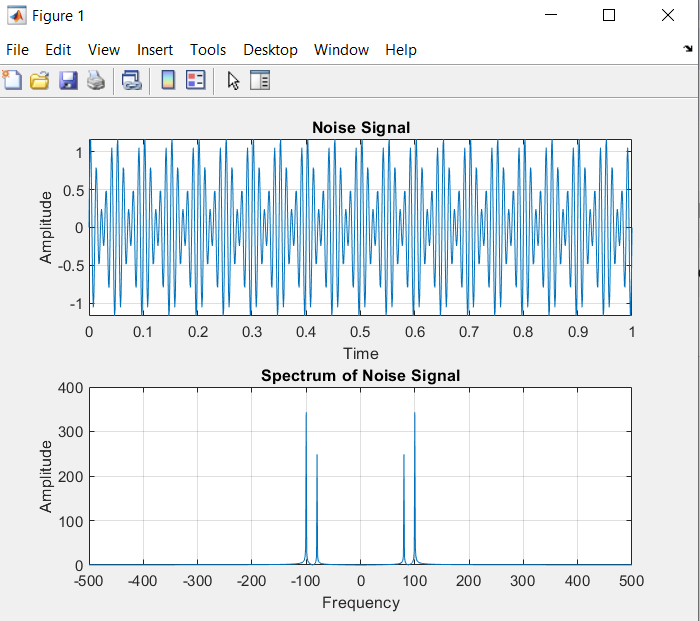
* **Compare/Confirm** that you are getting all the frequency generated in step 1 above.
* Generate some unwanted signal having frequencies say 80Hz and 100Hz (assume these signals represent noise) and different amplitudes say 0.5 and 0.7
* Obtain both time and frequency representation of noise and confirm they have different power as shown in Figure 4

Code:



* Time vector t defined from 0 to 1.
* Frequencies f1 (80 Hz) and f2 (100 Hz) defined.
* Signals y1 and y2 generated with respective amplitudes.
* Composite noise signal y created by adding y1 and y2.
* First subplot plots the time-domain noise signal.
* FFT applied to analyze frequency content.
* Frequency spectrum of noise signal plotted in second subplot.

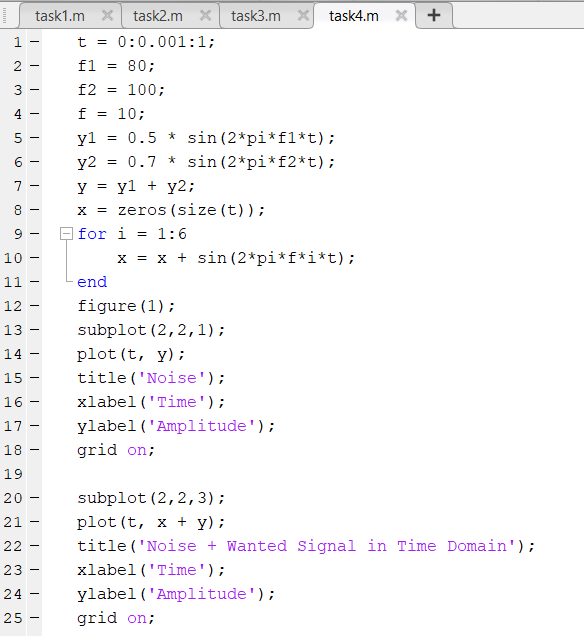
Output:



Task 04:

Add the noise to the composite signal (assume the noise is added to the signal during transmission) and obtain frequency spectrum.

Code:



A screenshot of a computer program

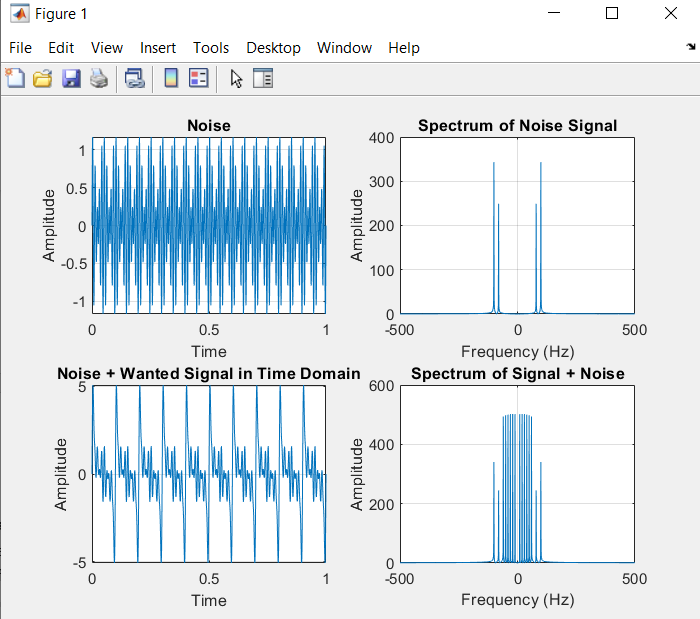
Description automatically generated

A screenshot of a computer program

Description automatically generated

* Time vector t defined from 0 to 1.
* Frequencies f1 (80 Hz) and f2 (100 Hz) set, and base frequency f (10 Hz) defined.
* Signals y1 and y2 created for noise, then combined into y.
* Signal x created by summing sine waves of base frequency f.
* First subplot shows the noise signal in time domain.
* Second subplot shows the combined signal (noise + wanted signal) in time domain.
* FFT applied to both noise and combined signal for frequency analysis.
* Frequency axis f\_axis calculated based on signal length and sampling rate.
* Third subplot shows the frequency spectrum of the noise signal.
* Fourth subplot shows the frequency spectrum of the combined signal (noise + wanted signal).

Output:



A white rectangular grid with black text

Description automatically generated