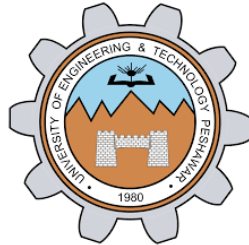Digital Signal Processing Lab

Lab Report # 02

Submitted By: AWAIS SADDIQUI

Registration No: 21PWCSE1993

Section: "A"

"On my honor, as student at University of Engineering and

Technology, I have neither given nor received unauthorized.

assistance on this academic work"

Student Signature: _____

Submitted to:

Sir Yasir Saleem Afridi

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CSE 402L: Digital Signal Processing

Demonstration of Concepts	Poor (Does not meet expectation (1))	Fair (Meet Expectation (2-3))	Good (Exceeds Expectation (4-5)	Score
	The student failed to demonstrate a clear understanding of the assignment concepts	The student demonstrated a clear understanding of some of the assignment concepts	The student demonstrated a clear understanding of the assignment concepts	**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%**

MATLAB Training:

Code a:

Make sure that you understand the colon notation. Explain in words what the following MATLAB. code will produce.

```
2
3 -     clc
4 -     clear all
5 -     jkl = 0 : 6
6       % vector start from 0 to 6 incremented by 1.
7 -     jkl = 2 : 4 : 17
8       % vector start from 2 to 17 incremented by 4.
9 -     jkl = 99 : -1 : 88
0       % start vector from 99 to 88 and decremented by 1
1 -     ttt = 2 : (1/9) : 4
2       % start from 2 to 4 and incremented by 0.1
3 -     tpi = pi * [ 0:0.1:2 ]
4       % start a vector from 0 to 2 incremented by 0.1 and then each value
5       % multiply with pi(3.14)
```

Output:

```
jkl =

    0    1    2    3    4    5    6

jkl =

    2    6   10   14

jkl =

   99   98   97   96   95   94   93   92   91   90   89   88

ttt =

  Columns 1 through 11

    2.0000    2.1111    2.2222    2.3333    2.4444    2.5556    2.6667    2.7778    2.8889    3.0000    3.1111

  Columns 12 through 19

    3.2222    3.3333    3.4444    3.5556    3.6667    3.7778    3.8889    4.0000

tpi =

  Columns 1 through 11

         0    0.3142    0.6283    0.9425    1.2566    1.5708    1.8850    2.1991    2.5133    2.8274    3.1416

  Columns 12 through 21

    3.4558    3.7699    4.0841    4.3982    4.7124    5.0265    5.3407    5.6549    5.9690    6.2832
```

Code b:

Extracting and/or inserting numbers into a vector is very easy to do. Consider the following definition of xx:

```matlab
clc
clear all
xx = [ zeros(1,3), linspace(0,1,5), ones(1,4) ]
xx(4:6)
size(xx)
length(xx)
xx(2:2:length(xx))
xx(2:2:end)
% xx(4:6) This code extract elements from array of index 4 to 6;
% size(xx) show the array size which is (1 12).
% length show the total length of array.
% Make a new vector start from 2 incremented by 2 till last index .
```

Output:

```
xx =

  Columns 1 through 11

        0        0        0        0   0.2500   0.5000   0.7500   1.0000   1.0000   1.0000   1.0000

  Column 12

   1.0000


ans =

        0   0.2500   0.5000


ans =

     1    12


ans =

    12


ans =

        0        0   0.5000   1.0000   1.0000   1.0000


ans =

        0        0   0.5000   1.0000   1.0000   1.0000
```

2.2 MATLAB Script Files:

Part a:

```matlab
1       %2.2 Part (b)
2 -     clc
3 -     clear all
4
5 -     xk = cos( pi*(0:11)/4 );
6 -     xk(1)
```

Xk(0) is undefined because in MATLAB array is started from index 1 .

Part b:

```matlab
1       .... .... (.)
2 -     clc
3 -     clear all
4
5        %<--- initialize the yy vector to be empty
6 -      k = -5:5;
7 -     yy = cos( k*pi/3 )
8
```
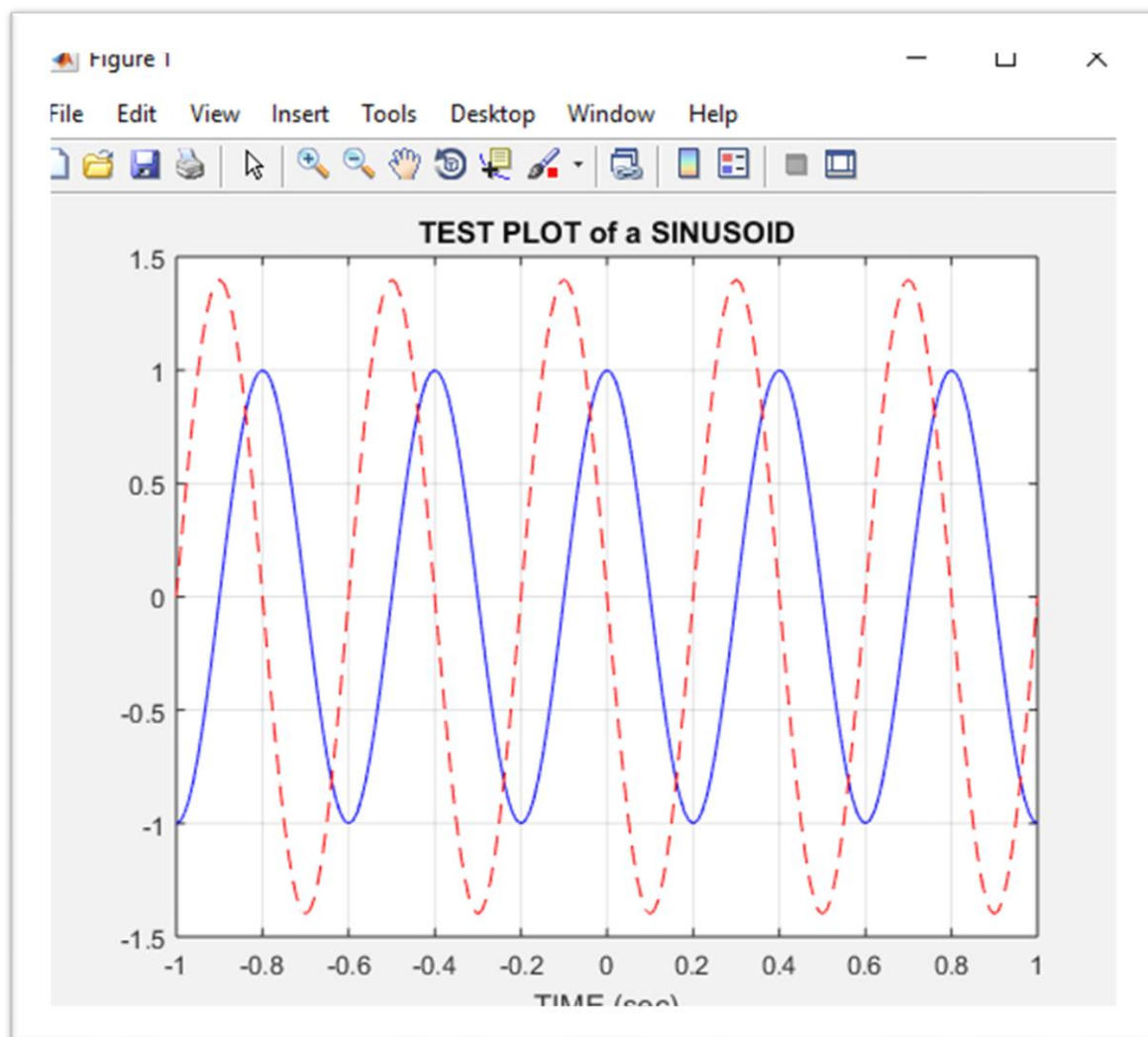
Part c:

```matlab
1       .... .... (.)
2
3 -     x = [-3 -1 0 1 3];
4 -     y = x.*x - 3*x;
5 -     plot( x, y )
6 -     z = x + y*sqrt(-1)
7 -     plot( z ) %<---- complex values: plot imag vs. real
```

Part d:

```
2
3 -    tt = -1 : 0.01 : 1;
4 -    xx = cos(5*pi*tt);
5 -    zz = 1.4*exp(j*pi/2)*exp(j*5*pi*tt);
6 -    plot(tt, xx, 'b-', tt, real(zz), 'r--'); %&lt;--- plot a sinusoid
7 -    grid on
8 -    title('TEST PLOT of a SINUSOID')
9 -    xlabel('TIME (sec)')|
```
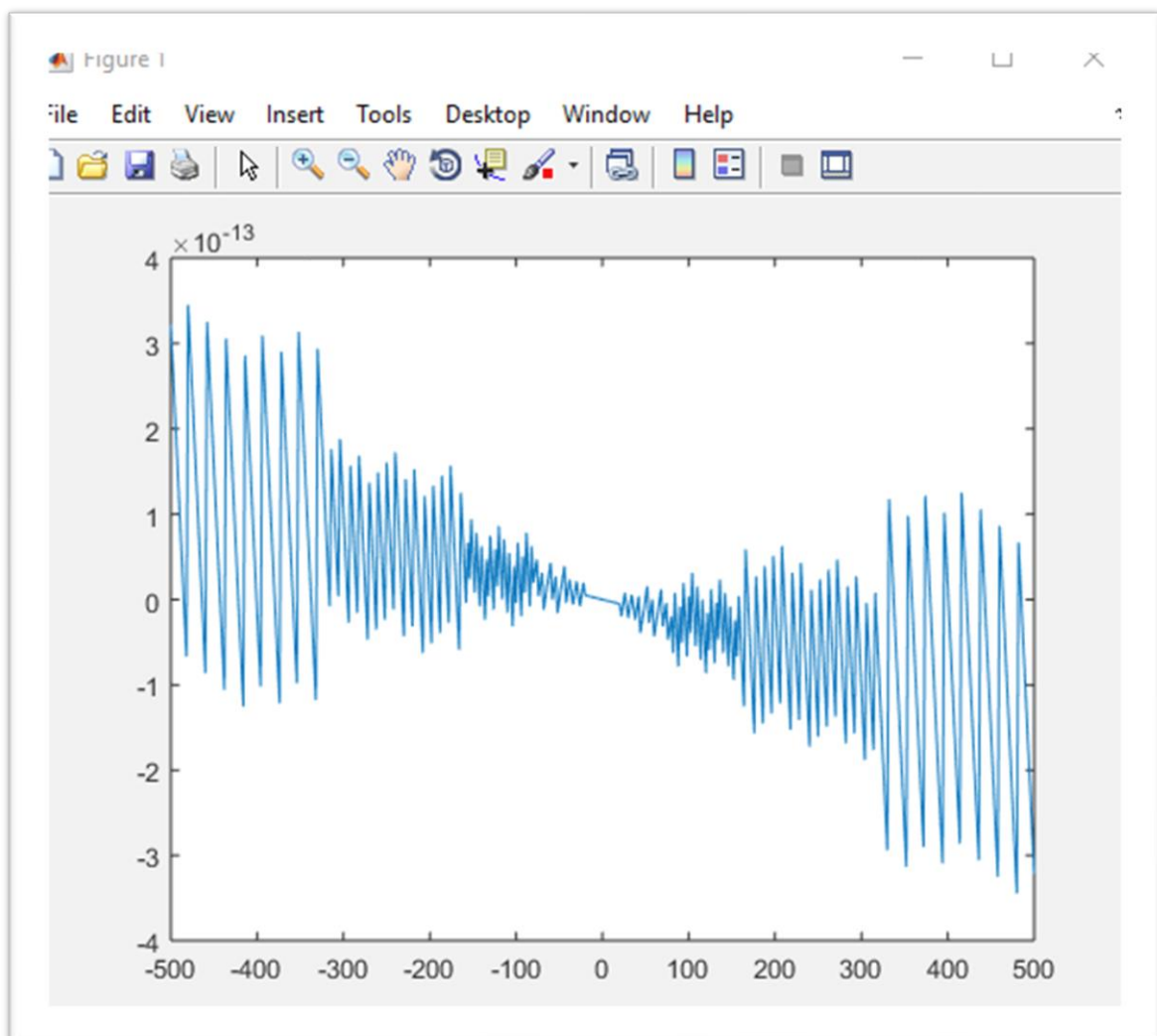
Output:

2.3 MATLAB Sound:

Part a:

```matlab
n = -500:0.1:500;

xx = sin(2*pi*n);
plot(n,xx);
soundsc(xx)
```

Output:

2.3 MATLAB Sound:

Code:

```
n = -500:2:500;

freq = 2000;
fs = 11025;
tt = 0:(1/fs):0.9;
xx = sin(2*pi*freq*tt)
soundsc(xx)
```

Output: