DSP Assignment

(1507127) Samsruti Dash

1. Write a MATLAB program to verify the foll problem:
The signals $x(t) = \cos(26\pi t)$ & $x_2(t) = \cos(6\pi t)$ are both sampled with $f_s = 10$ kHz. Show that the two sequences of samples so obtained are identical.

Editor Window

```
clc
n = 0:10;
fs = 10;
T = 1/ts;
t = n*T;
x1 = cos(26*pi*t);
x2 = cos(6*pi*t);
disp('sampled signal x1:');
disp(x1);
disp('sampled signal x2:');
disp(x2);
subplot(2,1,1), stem(x,x,1);
xlabel('index n'); ylabel('x1');
subplot(2,1,2), stem(n,x2);
xlabel('index n'); ylabel('x2');
```

COMMAND WINDOW:

Sampled signal x1:

1.00	−0.3090	−6.8090	0.8090	0.3090
−1.000	0.3090	0.8090	−0.8090	−0.3090
1.000				

Sampled signal x2:

1.000	−0.3090	−0.8090	0.8090	0.3090
−1.000	0.3090	0.8090	−0.8090	−0.3090
1.000				

3) Determine the amplitude response $H(e^{j\omega})$ & locations of zeros of $H(z)$ for the given impulse response.

$n(x) = \langle 3, -1, -7, 4, 5, 4, -7, -1, 3\rangle$

→ $n(4) = \langle 3, -1, -7, 4, 5, 4, -7, -1, 3\rangle$

$H(z) = 3 - z^{-1} - 7z^{-2} + 4z^{-3} + 5z^{-4} + 4z^{-5} - 7z^{-6}$
$$z^{-7} + 2z^{-8}$$

$H(\omega) = 3 - e^{-j\omega} - 7e^{-2j\omega} + 4e^{-3j\omega} + 5e^{-4j\omega} + 4e^{-5j\omega}$
$$- 7e^{-6j\omega} - e^{-7j\omega} + 3e^{-8j\omega}$$

MATLAB

EDITOR WINDOW

```
clc;
h = [3 -1 -7 4 5 4 -7 -1 3];
den = [1];
sys = tf(h, den);
z = zero(sys);
disp('zeros of system are:');
disp(z);
subplot(2,1,1), stem(z);
title('zeros of the system');
n = length(h);
H = dtft(h, n);
subplot(2,1,2), stem(1:n, H);
xlabel('index n'), ylabel('|H(w)|'), title('Amplitude response');

function [x] = dtft(x, n)
w = linspace(-pi, pi, length(n));
X = x * exp(-1j .* n' * w);
end
```

COMMAND WINDOW:

```
zeros of the system are:
  -1.6078                1.1284 + 0.5776i
  -0.5506 + 0.8348i      1.1284 - 0.5776i
  -0.3506 - 0.8348i      0.9022 + 0.3595i
  -0.6289                0.7022 - 0.3595i
```

File   Edit   Text   Go   Cell   Tools   Debug   Desktop   Window   Help

```
1 -    clc;
2 -    h=[3 -1 -7 4 5 4 -7 -1 3];
3 -    den=[1];
4 -    sys=tf(h,den);
5 -    z=zero(sys);
6 -    disp('Zeros of system are;');
7 -    disp(z);
8 -    subplot(2,1,1),stem(z);
9 -    title('Zeros of the System');
10 -   n=length(h);
11 -   H=dtftfn(h,n);
12 -   subplot(2,1,2),stem(1:n,H);
13 -   xlabel('index n'),ylabel('H(w)'),title('Amplitude Response');
```

assign... ×   assign... ×   dtftfn.... ×

script   Ln 7   Col 9   OVR

MATLAB R2012a

File   Edit   Debug   Parallel   Desktop   Window   Help

Current Folder: C:\Users\kiit1\Desktop\1507140\cslab

Shortcuts   How to Add   What's New

Current Folder

« 1507140 ▸ cslab ▸

Name △
- exp7_2_grt_rtw
- slprj
- untitled_grt_rtw
- 2_1.jpg
- assigndsp.asv
- assigndsp.m
- dtftfn.m
- ex10_2.m
- exp1.mdl
- exp1_1.m
- exp1_2.m
- exp1_3.m
- exp1_4.m
- exp1_6.m
- exp2_1.m
- exp2_2.m
- exp2_3.m
- exp3_1.m
- exp3_2.m
- exp3_3.m
- exp3_4.m
- exp3_5.m
- exp3_6.m
- exp3_7.m
- exp3_8.m
- exp3_9.m
- exp3_10.m
- exp4_1.m
- exp4_2.m
- exp4_3.m

Details

Command Window

```
Zeros of system are:
  -1.6028
  -0.5506 + 0.8348i
  -0.5506 - 0.8348i
  -0.6239
   1.1284 + 0.5776i
   1.1284 - 0.5776i
   0.7022 + 0.3595i
   0.7022 - 0.3595i

fx >> |
```

Workspace

Select data to plot

Name △	Value	M
H	[-3.0000 - 0.0000i,1.00...	1.
T	0.1000	0.
den	1	1
fs	10	10
h	[3,-1,-7,4,5,4,-7,-1,3]	-7
n	9	9
num	[3,-1,-7,4,5,4,-7,-1,3]	-7
sys	<1x1 tf>	
t	<1x11 double>	0
x1	<1x11 double>	-1
x2	<1x11 double>	-1
z	[-1.6028 + 0.0000i,-0....	-0

Command History

```
  [1 2 -1 2 3 -2 -3 -1 1 1 2
  [1 2]
  oversave
  [1 2 -1 2 3 -2 -3 -1 1 1 2
  [1 2]
  oversave
  [1 2 -1 2 3 -2 -3 -1 1 1 2
  [1 2]
  u(:)
  convolvfn
-- 07-Apr-18 6:34 PM --%
  assign
  assigndsp
```

Start

OVR

Search the web and Windows

ENG
INTL
9:01 PM
07-Apr-18

MATLAB R2012a

File Edit Debug Parallel Desktop Window Help

Shortcuts How to Add What's New

Current Folder: C:\Users\kiit1\Desktop\1507140\cslab

Current Folder

« 1507140 ▶ cslab ▶

Name ▲

exp7_2_grt_rtw
slprj
untitled_grt_rtw
2_1.jpg
assign3.m
assigndsp.asv
assigndsp.m
dtftfn.m
ex10_2.m
exp1.mdl
exp1_1.m
exp1_2.m
exp1_3.m
exp1_4.m
exp1_6.m
exp2_1.m
exp2_2.m
exp2_3.m
exp3_1.m
exp3_2.m
exp3_3.m
exp3_4.m
exp3_5.m
exp3_6.m
exp3_7.m
exp3_8.m
exp3_9.m
exp3_10.m
exp4_1.m
exp4_2.m

Details

Command Window

```
Sampled signal x1:
  Columns 1 through 9

    1.0000   -0.3090   -0.8090    0.8090    0.3090   -1.0000    0.3090    0.8090   -0.8090

  Columns 10 through 11

   -0.3090    1.0000

Sampled signal x2:
  Columns 1 through 9

    1.0000   -0.3090   -0.8090    0.8090    0.3090   -1.0000    0.3090    0.8090   -0.8090

  Columns 10 through 11

   -0.3090    1.0000

fx >> 
```

Workspace

Select data to plot

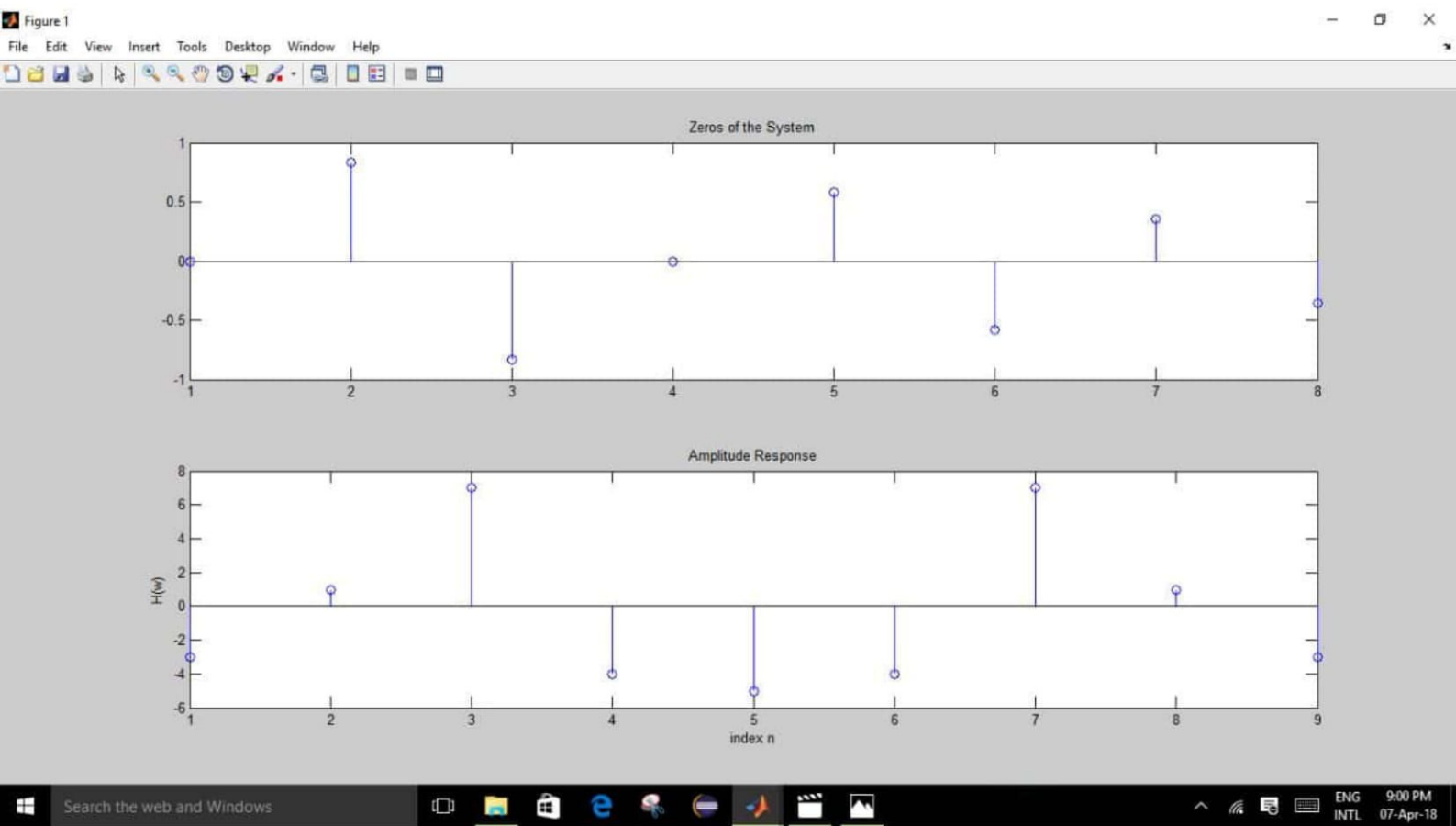| Name ▲	Value
H	[-3.0000 - 0.0000i,1.00...
T	0.1000
den	1
fs	10
h	[3,-1,-7,4,5,4,-7,-1,3]
i	-3
n	<1x11 double>
num	[3,-1,-7,4,5,4,-7,-1,3]
sys	<1x1 tf>
t	<1x11 double>
x1	<1x11 double>
x2	<1x11 double>

Command History

```
  [1 2 -1 2 3 -2 -3 -1 1 1 2
  [1 2]
  oversave
  [1 2 -1 2 3 -2 -3 -1 1 1 2
  [1 2]
  u(:)
  convolvfn
%-- 07-Apr-18 6:34 PM --%
  assign
  assigndsp
  assign3
  5
  assign
```

Start

OVR

Search the web and Windows

ENG 9:30 PM
INTL 07-Apr-18

```
1 -     clc;
2 -     n=0:10;
3 -     fs=10;
4 -     T=1/fs;
5 -     t=n*T;
6 -     x1=cos(26*pi*t);
7 -     x2=cos(6*pi*t);
8 -     subplot(2,1,1),stem(n,x1);
9 -     disp('Sampled signal x1:');
10 -    disp(x1);
11 -    disp('Sampled signal x2:');
12 -    disp(x2);
13 -    xlabel('index n'),ylabel('x1');
14 -    subplot(2,1,2),stem(n,x2);
15 -    xlabel('index n'),ylabel('x2');
```

script   Ln 15   Col 32   OVR