American International University- Bangladesh

Department of Computer Engineering

COE3103: Data Communication

Course Name:	Data Communication	**Course Code:**	COE 3103
Semester:	Spring 2022	**Sec:**	A
Faculty:	ABIR AHMED		

Lab Report No	02
Lab Report title:	Study of signal frequency, spectrum, bandwidth, bit rate using MATLAB.

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Lab Report 2

Title: Study of signal frequency, spectrum, bandwidth, bit rate using MATLAB

Performance Task for Lab Report: (your ID = **AB-CDEFG-H**)

**Generate two CDEF hertz sinusoids with different amplitudes and phases. x1(t) = A1 cos(2π(CDEF)t + j1) x2(t) = A2 cos(2π(CDEF)t + j2)

(a) Select the value of the amplitudes as follows: let A1 = **AB** and A2 = **GH**. For the phases, use j1 = **DG** (in degrees), and take j2 = 30º. When doing computations in MATLAB, make sure to convert degrees to radians.

(b) Make a plot of both signals over a range of t that will exhibit approximately 3 cycles. Make sure the plot starts at a negative time so that it will include t = 0.

(c) Verify that the phase of the two signals x1(t) and x2(t) is correct at t = 0, and also verify that each one has the correct maximum amplitude.

(d) Use subplot (3,1,1) and subplot (3,1,2) to make a three-panel subplot that puts both of these plots on the same window. See help subplot.

(e) Create a third sinusoid as the sum: x3(t) = x1(t) + x2(t). In MATLAB this amounts to summing the vectors that hold the samples of each sinusoid. Make a plot of x3 (t) over the same range of time as used in the previous two plots. Include this as the third panel in the window by using subplot (3,1,3).

Answer to the question no (a)

Given that, ID = AB-CDEFG-H

= 20-42970-1

A1 = AB= 20

A2 = GH= 01

j1 = DG = 20

j2 =30º

CDEF= 4297

$x1(t) = A1 \cos(2\pi(CDEF)t + j1)$

$= 20 \cos(2\pi(4297)t + (20\pi/180))$

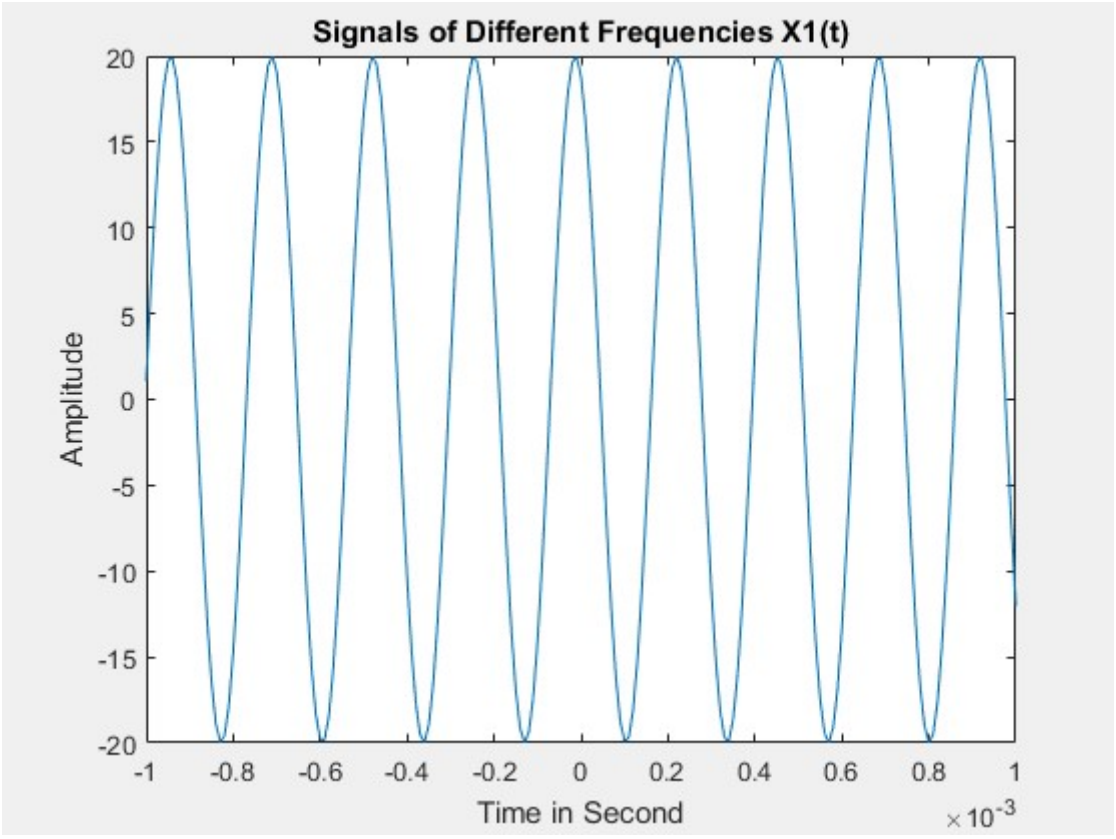
$x2(t) = A2 \cos(2\pi(CDEF)t + j2)$

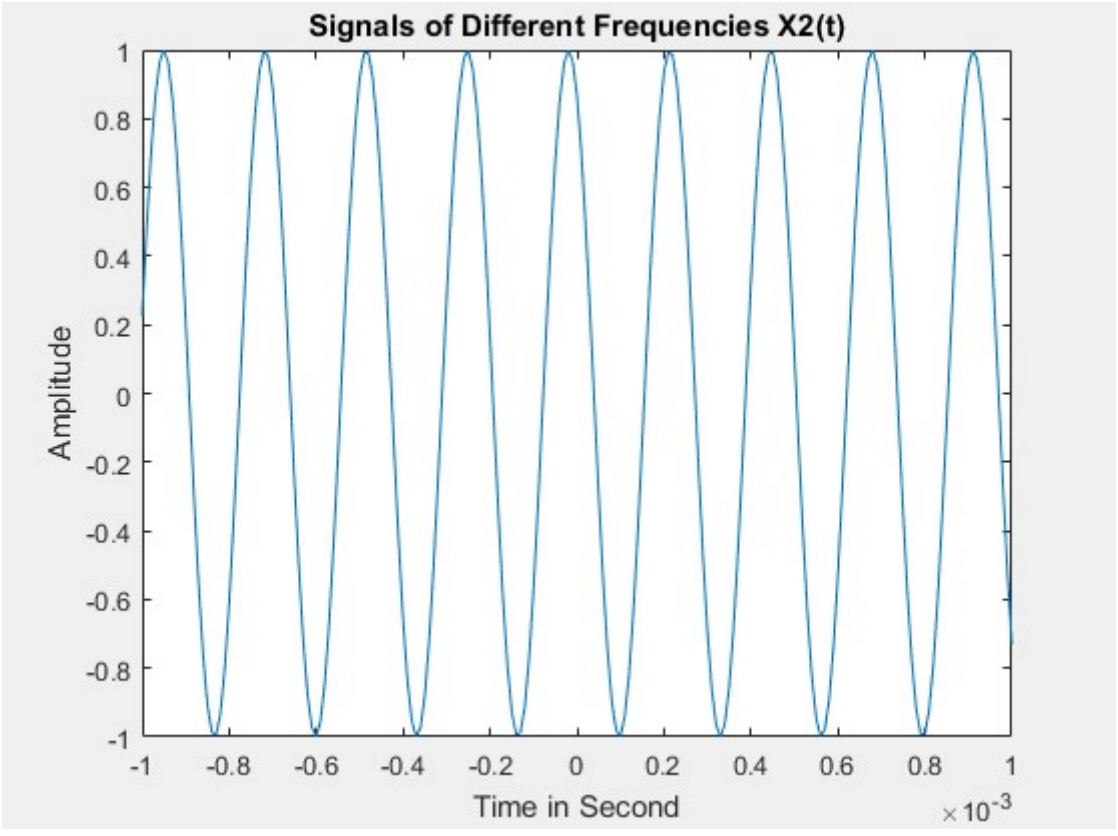
$= \cos(2\pi(4297)t + (30\pi/180))$

Answer to the question no (b)

Code:

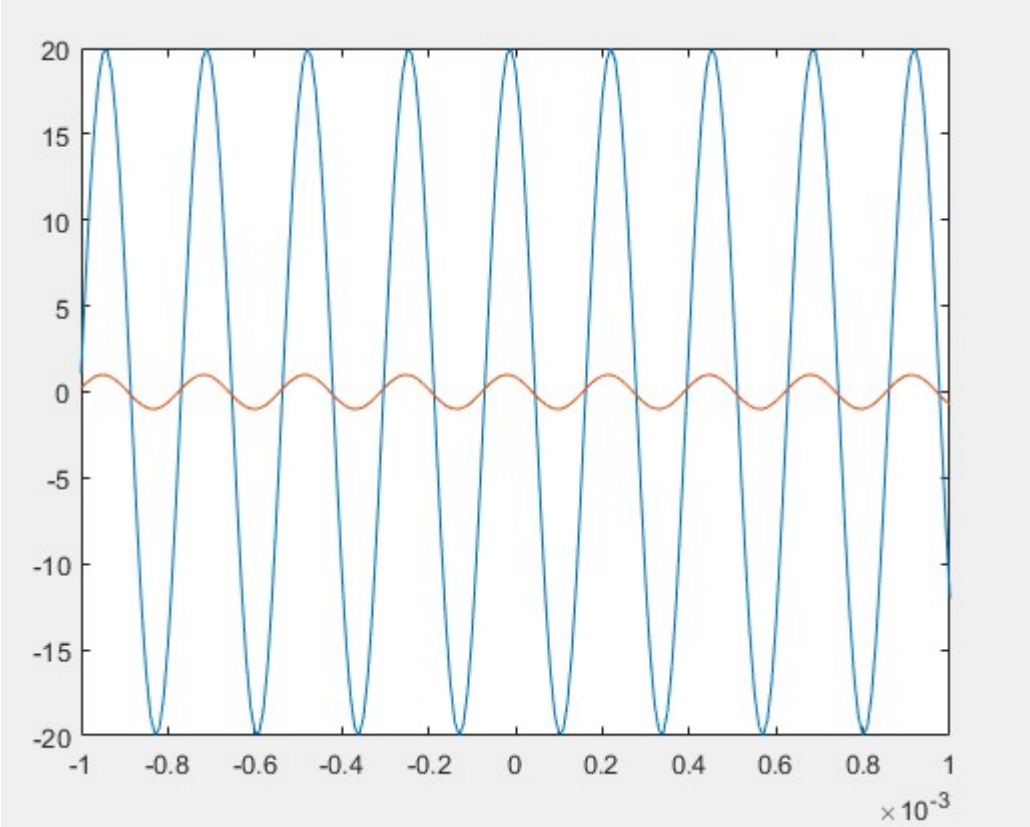
```
clc;
clear all;
close all;
fs=100000;
d=0.001;
t=-d:1/fs:d;
A1=20;
A2=1;
x1 = 20*cos(2*pi*(4297)*t + (20*pi/180));
x2 = cos(2*pi*(4297)*t + (30*pi/180));
plot(t,x1);
title('Signals of Different Frequencies X1(t)')
xlabel('Time in Second')
ylabel('Amplitude')
figure;
plot(t,x2);
title('Signals of Different Frequencies X2(t)')
xlabel('Time in Second')
ylabel('Amplitude')
```


Signals of Different Frequencies X1(t)
Amplitude
Time in Second
×10^-3


Signals of Different Frequencies X2(t)
Amplitude
Time in Second
×10^-3

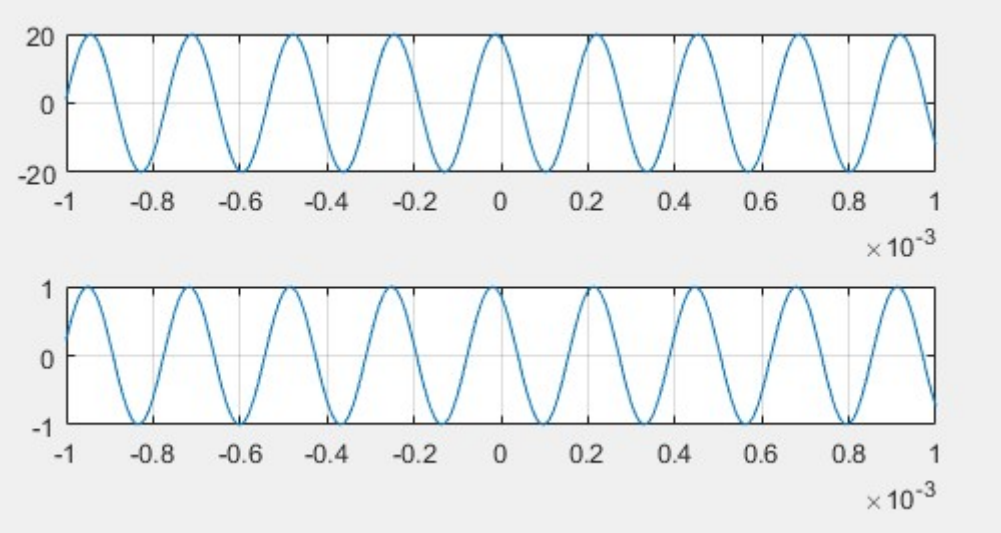
Answer to the question no (c)

```
clc;
clear all;
close all;
fs=100000;
d=0.001;
t=-d:1/fs:d;
A1=20;
A2=1;
x1 = 20*cos(2*pi*(4297)*t + (20*pi/180));
x2 = cos(2*pi*(4297)*t + (30*pi/180));
plot(t,x1);
hold on;
plot(t,x2)
hold off;
```



Answer to the question no (d)

```
clc;
clear all;
close all;
fs=100000;
d=0.001;
t=-d:1/fs:d;
A1=20;
A2=1;
x1 = 20*cos(2*pi*(4297)*t + (20*pi/180));
subplot(3,1,1);
plot(t,x1);
grid on;
x2 = cos(2*pi*(4297)*t + (30*pi/180));
subplot(3,1,2);
plot(t,x2);
grid on;
```



Answer to the question no (e)

```
clc;
clear all;
close all;
fs=100000;
d=0.001;
t=-d:1/fs:d;
A1=20;
A2=1;
x1 = 20*cos(2*pi*(4297)*t + (20*pi/180));
x2 = cos(2*pi*(4297)*t + (30*pi/180));
x3=x1+x2;
subplot(3,1,1)
plot(t,x1,'b')
xlabel('Time in Second')
ylabel('Amplitude')
title('X1(t)')
subplot(3,1,2)
plot(t,x2,'r')
xlabel('Time in Second')
```

```
ylabel('Amplitude')
title('x2(t)')
subplot(3,1,3)
plot(t,x3,'g')
xlabel('Time in Second')
ylabel('Amplitude')
title('X3(t)=X1(t)+X2(t)')
```