AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Science and Technology

Course Title: Data Communication

Lab Report-1

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**Generate two sinusoids with different amplitudes, frequencies, and phases.

x1(t) = K1*cos(2π(E+F+5)t + J1), x2(t) = K2*cos(2π(C+D+5)t + J2) The value of the amplitudes are as follows: let **K1** = A+B and **K2** = G+H+2. For the phases, use **J1** = D+G+20 (in degrees), and take **J2** = 30º. When doing computations in Matlab, make sure to convert degrees to radians**.**

Here,
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So, A=2, B=0, C=4, D=2, E=4, F=5, G=1, H=1

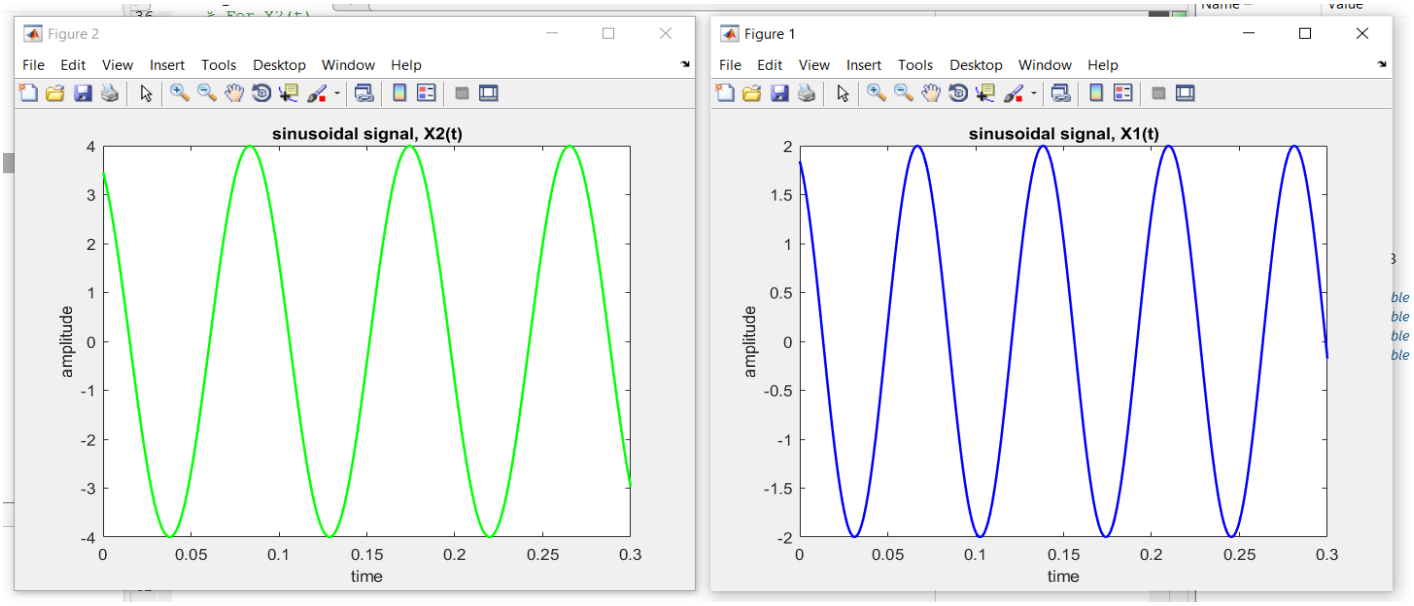
(a) Make a plot of both signals on two separate figure windows, over a range of 't' that will exhibit approximately 3 cycles. Make sure that you have enough samples per period of the wave to have a smooth signal in figure.

MATLAB Code:

```
A=2;
B=0;
C=4;
D=2;
E=4;
F=5;
G=1;
H=1;

K1=A+B;
K2=G+H+2;

J1=deg2rad(D+G+20); % converting degree to radian
J2=deg2rad(30);

% Generating time array for approx. 3 cycles
sampling_rate=1000;
sampling_interval=1/sampling_rate;
t=0:sampling_interval:3/10;
```

```
% For X1(t)
X1_t=K1*cos(2*pi*(E+F+5)*t+J1);
plot(t,X1_t,'b','linewidth',1.5);
%xlim([0 0.215]);
xlabel('time');
ylabel('amplitude');
title('sinusoidal signal, X1(t)');

% For X2(t)
figure;
X2_t=K2*cos(2*pi*(C+D+5)*t+J2);
plot(t,X2_t,'g','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('sinusoidal signal, X2(t)');
```

Output:

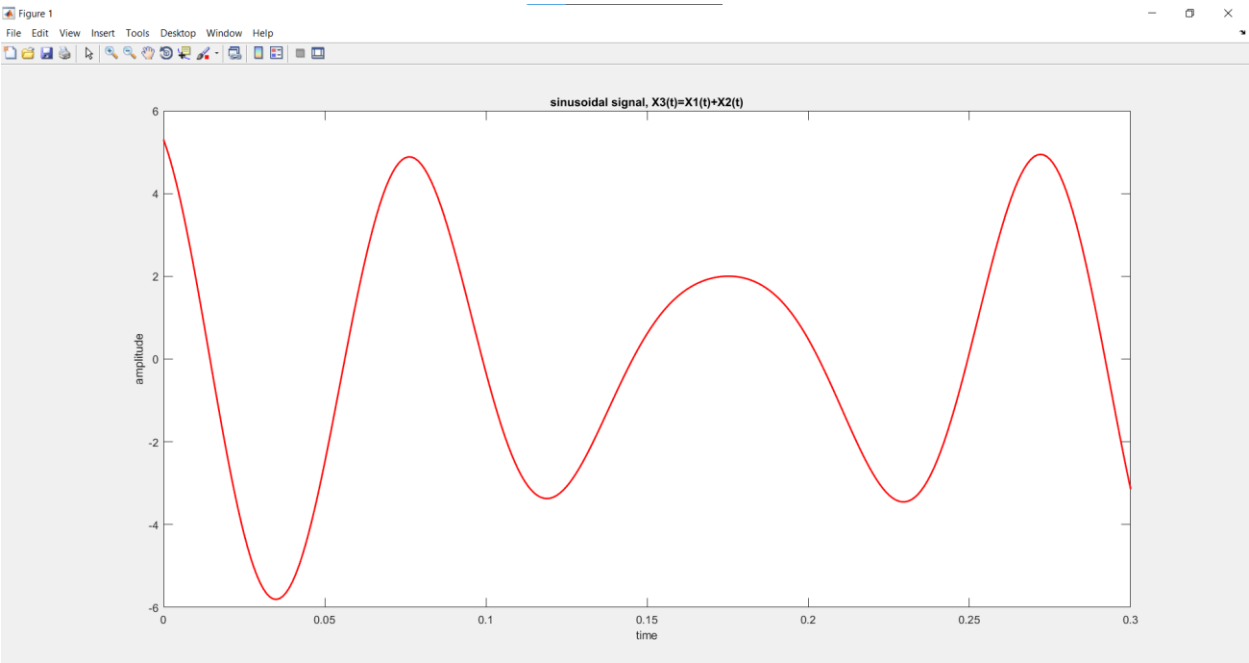


(b) Create a third sinusoid as the sum: x3(t) = x1(t) + x2(t). In Matlab this amounts to summing the vectors that hold the samples of each sinusoid. Make a plot of x3(t) over the same range of time as used in the previous two plots.

MATLAB Code:

```
% For X3(t)
X3_t=X1_t+X2_t;
plot(t,X3_t,'r','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('sinusoidal signal, X3(t)=X1(t)+X2(t)');
```

Output:



(c) Use subplot (3,1,1), subplot (3,1,2), and subplot (3,1,3) to make a three-panel subplot that puts all of three signals (x1(t), x2(t), and x3(t)) on the same window. See help subplot.

MATLAB Code:

```
subplot(3,1,1);
plot(t,X1_t,'b','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('sinusoidal signal, X1(t)');

subplot(3,1,2);
plot(t,X2_t,'g','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('sinusoidal signal, X2(t)');

subplot(3,1,3);
plot(t,X3_t,'r','linewidth',1.5);
xlabel('time');
ylabel('amplitude');
title('sinusoidal signal, X3(t)=X1(t)+X2(t)');
```

Output: