LAB ASSESSMENT TASK

DATA COMMUNICATION [D]

Submitted by:

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Submitted to:

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CODE OF TASK 1:

```
%AB-CDEFG-H
%20-42595-1
clc
fs = 1000; % sampling frequency
t = 0:1/fs:1-1/fs; % time duration
%here for my case,
AMP1 = 2; % Amplitude for first signal
AMP2 = 14; % Amplitude for second signal
FREQ1 = 0; % Frequency of first signal
FREQ2 = 10; % Frequency of second signal
%task 1
x1 = AMP1*sin(2*pi*FREQ1*t);
x2 = AMP2*sin(2*pi*FREQ2*t+30*pi/180); % 30 degree shifted
form the first signals
x_com = x1 + x2; % my composite signal
%Take fourier transform
fx1 = fft(x_com);
fx1 = fftshift(x_com)/(fs/2);
%Next, calculate the frequency axis, which is defined by
the
sampling rate
f = fs/2*linspace(-1.5,1.5,fs);
%Since the signal is complex, we need to plot the magnitude
to
get it to
%look right, so we use abs (absolute value)
figure;
plot(f, abs(x_com), 'LineWidth',2);
title('Composite Signal');
axis([0 100 -1 18])
xlabel('Frequency (Hz)');
ylabel('magnitude');
```

CODE TASK 2:

```
clc
fs = 100000;
t = [0.0131:1/fs:0.0452];
%here for my case,
AMP1 = 2; % Amplitude for first signal
```

```
AMP2 = 14; % Amplitude for second signal
FREQ1 = 0; % Frequency of first signal
FREQ2 = 10; % Frequency of second signal
%task 1
x1 = AMP1*sin(2*pi*FREQ1*t);
x2 = AMP2*sin(2*pi*FREQ2*t+30*pi/180); % 30 degree
shifted form the first signals
sig = x1 + x2; % my composite signal % Original signal, a
sine wave
partition = linspace(-15,15,16); % Length 4, to represent
5 intervals
codebook = linspace(-15,15,17); % Length 5, one entry for
each interval
[index,quants] = quantiz(sig,partition,codebook); %
Quantize.
figure
plot(t,sig,'x',t,quants,'.')
axis([0.01313 0.0452 -20 20])
title('Quantized Signal')% title of the figure
legend('Original signal','Quantized signal');
```

CODE TASK 3:

```
clc
fs = 8000; % Sampling frequency
t = 0:1/fs:1-1/fs; % Time duration
%here for my case,
AMP1 = 2; % Amplitude for first signal
AMP2 = 14; % Amplitude for second signal
FREQ1 = 0; % Frequency of first signal
FREQ2 = 10; % Frequency of second signal
%task 1
x1 = AMP1*sin(2*pi*FREQ1*t);
x2 = AMP2*sin(2*pi*FREQ2*t+30*pi/180); % 30 degree shifted
form the first signals
x_com = x1 + x2; % my composite signal
bandwidth = obw(x_com,fs) % Bandwidth of the signal
s = 0.2; % noise amplitude
varnoise = s^2;
%noise
noise = s*randn(size(x_com));
%noisy signal
noisySignal = x_com + noise;
```

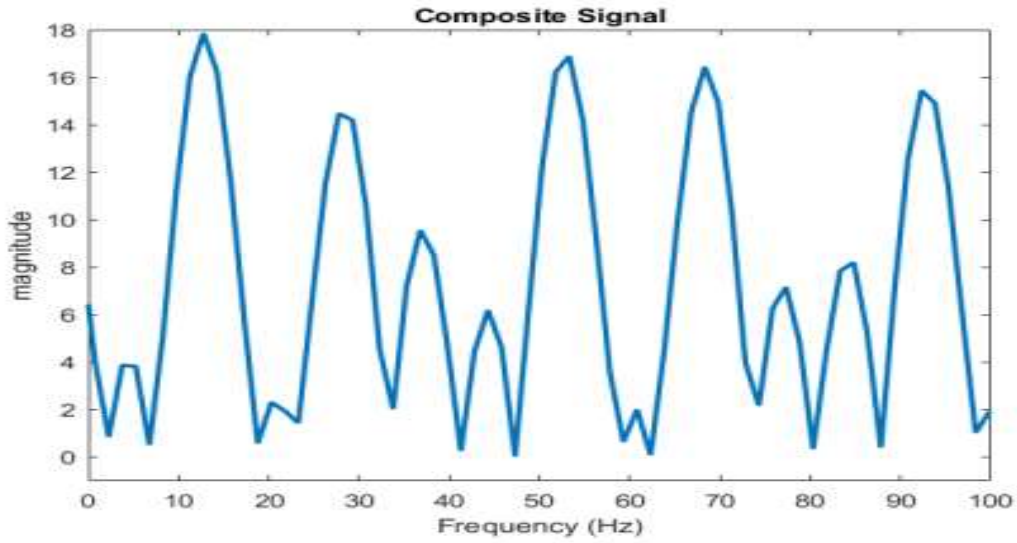
```
SNR = snr(noisySignal) %Calculation of SNR using snr
function
max_capacity = ceil(bandwidth * log2(1 + SNR)) %max.
capacity
of the composite signal considering SNR.
```

CODE TASK 4:

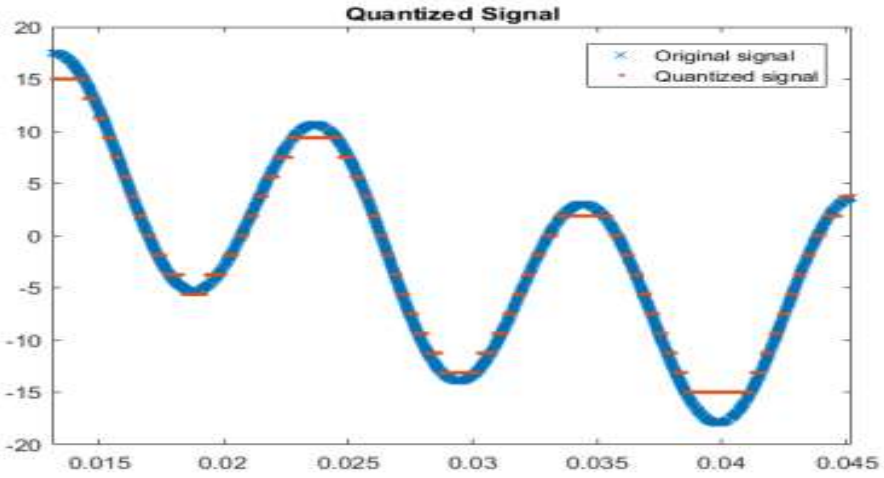
```
clc
fs = 10000; % Sampling frequency
t = 0:1/fs:1-1/fs; % Time duration
%here for my case,
AMP1 = 2; % Amplitude for first signal
AMP2 = 14; % Amplitude for second signal
FREQ1 = 0; % Frequency of first signal
FREQ2 = 10; % Frequency of second signal
%task 1
x1 = AMP1*sin(2*pi*FREQ1*t);
x2 = AMP2*sin(2*pi*FREQ2*t+30*pi/180);
s = 0.2; % noise amplitude from task 3
varnoise = s^2;
bandwidth_1 = obw(x1,fs) % bandwidth signal 1
%noise
noise = s*randn(size(x1));
%noisy signal
noisySignal = x1 + noise;
SNR_1 = snr(noisySignal); %Calculation of SNR using snr
function
THD_1 = thd(x1) %THD of signal 1
max_capacity_1 = ceil(bandwidth_1 * log2(1 + SNR_1))
%mixiмum
capacity signal 1
THD_1 = thd(x1)
bandwidth_2 = obw(x2,fs) % bandwidth signal 2
%noise
noise = s*randn(size(x2));
%noisy signal
noisySignal = x2 + noise;
SNR_2 = snr(noisySignal); %Calculation of SNR using snr
function
THD_2 = thd(x2) %THD of signal 2
max_capacity_2 = ceil(bandwidth_2 * log2(1 + SNR_2))
%mixiмum
capacity signal 2
```

OUTPUTS:

TASK 1:



TASK 2:



TASK 3:

```
bandwidth =

    0.9900


SNR =

   33.9781


max_capacity =

     6
```

TASK 4:

```
THD_1 =

 -293.3288


max_capacity_1 =

     5


THD_1 =

 -293.3288


bandwidth_2 =

    0.9900


THD_2 =

 -309.3997


max_capacity_2 =

     5
```