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Id: 17-35634-3

Section: D

Matlab code:

```
close all;

clc;

%question no 1

%Id - 17-35634-3

%Id - AB-CDEFG-H

A = 1; B = 7; C =3; D = 5; E = 6; F = 3;

G = 4; H = 3;

fs = 80000;

t=0:1/fs:1-1/fs;%time duration

AMP1 = 35;

AMP2 = 56;

AMP3 = 63;

FREQ1 = 173;

FREQ2 = 356;

FREQ3 = 634;

%sampling frequency

sift1 =deg2rad(30);

sift2 =deg2rad(60);

x1 = AMP1*cos(2*pi*FREQ1*t);

x2 = AMP2*cos(2*pi*FREQ2*t+sift1);
```

```
x3 = AMP3*cos(2*pi*FREQ3*t+sift2);
```

```
composite = x1 + x2 + x3;
```

```
subplot (5, 1, 1);%first (x1) signal
```

```
plot(t,x1,'b');%first (x1) signal
```

```
axis([0.01 0.05 -50 50]);%first (x1) signal
```

```
xlabel('Time');%first (x1) signal
```

```
ylabel('Amplitude');%first (x1) signal
```

```
title('Input Signal')%first (x1) signal
```

```
subplot(5, 1, 2);%second(x2) signal
```

```
plot(t,x2,'c');%second(x2) signal
```

```
axis([0.01 0.05 -80 80]);%second(x2) signal
```

```
xlabel('Time');%second(x2) signal
```

```
ylabel('Amplitude');%second(x2) signal
```

```
subplot(5, 1, 3);%third(x3) signal
```

```
plot(t,x3,'r');%third(x3) signal
```

```
axis([0.01 0.05 -100 100]);%third(x3) signal
```

```
xlabel('Time');%third(x3) signal
```

```
ylabel('Amplitude');%third(x3) signal
```

```
%composite signal
```

```
subplot (5, 1, 4);
```

```
plot(t,composite,'m');
```

```
axis([0.01 0.05 -200 200]);
```

```
xlabel('Time');  
ylabel('Amplitude');  
title('Input Signal');
```

```
%Take fourier transform  
fx = fft(composite);%composite signal  
fx = fftshift(fx)/(fs/2);  
f=fs/2*linspace(-1,1,fs);  
subplot(5, 1, 5);  
plot(f,abs(fx),'LineWidth',1.5);  
xlabel('Fz (Hz)');  
ylabel('magnitude')
```

```
%question no 2  
%quantize signal  
partition = [-131, -113, -95, -77, -59, -41, -23, -5, 13, 31, 49, 67, 85, 103, 121]; %Length  
codebook =[-140:18:140];  
[index,quants] = quantiz(composite,partition,codebook);  
figure;  
plot(t,composite,t, quants,'.');  
axis([0.001 0.0045 -142 142]);  
legend ('original signal','Quantized signal');
```

```
%question no 3  
AMP1= 35;  
Powfund = AMP1^2/2;
```

```

s = 0.2;
varnoise = s^2;
a=4.25;
powharm = a^2/2;
noise = s*randn (size(x1));
noisySignal = x1 + noise+ a*sin(2*pi*fs*t);
THD = thd(noisySignal, fs);
SNR = snr(noisySignal);
bw_with = obw(noisySignal, fs);
bw_without = obw(x1,fs);

capacity = bw_with*log2(1+SNR);
SINAD = sinad(noisySignal);
L = 2^(capacity/(2*bw_without));

%question no 4
output = [bw_with bw_without;capacity L; SNR SINAD]

```

OUTPUT:





