



American International University- Bangladesh

COE 3103: DATA COMMUNICATION

Mid Lab Report 02 Spring 2021-2022

Section: Q
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Submitted by,

Student Name	Student Id
Rahman, Sheikh Talha Jubayer	19-41468-3

Tasks:

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

****Generate a composite signal using three simple signals as,**

$$x1 = a1 \cdot \cos(2\pi \cdot f1 \cdot t), x2 = a2 \cdot \sin(2\pi \cdot f2 \cdot t), x3 = a3 \cdot \cos(2\pi \cdot f3 \cdot t)$$

$$\text{signal_x} = x1 + x2 + x3$$

Select the values of the amplitude and frequency as follows: $a1 = A + C + 1$, $a2 = A + D + 2$, $a3 = A + E + 1$, $f1 = A + E + 1$, $f2 = A + D + 2$, $f3 = A + C + 1$.

(a) Show time domain and frequency domain representations of **signal_x** in a single figure window using subplot. Use **axis**, or **xlim**, or **ylim** to appropriately represent the signal.

(b) Quantize **signal_x** in 8 equally distributed levels and provide image for **one cycle** of the original signal and quantized signal. Use **axis**, or **xlim**, or **ylim** to appropriately represent the signal.

Solution:

```
%ID: 19-41468-3
```

```
A = 1;
B = 9;
C = 4;
D = 1;
E = 4;
F = 6;
G = 8;
H = 3;
```

```
a1 = A+C+1;
a2 = A+D+2;
a3 = A+E+1;
f1 = A+E+1;
f2 = A+D+2;
f3 = A+C+1;
```

```
fs = 1000;
t = 0:1/fs:1;
```

```
x1 = a1*cos(2*pi*f1*t);
x2 = a2*sin(2*pi*f2*t);
x3 = a3*cos(2*pi*f3*t);
```

```
signal_x = x1+x2+x3;
```

```
%solution of (a)
figure
```



```

subplot(2,1,1)
plot(t,signal_x) %output in figure 1
axis([0 1 -20 20])
title('Time-Domain Representation of signal x');
xlabel('Time (s)');
ylabel('Amplitude');

fx = abs(fftshift(fft(signal_x)))/(length(signal_x)/2);
freq = linspace(-fs/2, fs/2, length(signal_x));
subplot(2,1,2)
bar(freq, fx, 'linewidth',3) %output in figure 1
axis([-10 10 0 15])
title('Frequency-Domain Representation of signal x')
xlabel('Frequency (Hz)')
ylabel('Amplitude')

%solution of (b)
figure
p = linspace(-14,14,7);
c = linspace(-15.53,15.53,8);
[i,q] = quantiz(signal_x,p,c);
plot(t,signal_x,'x',t,q,'.') %output in figure 2
axis([0 0.5 -16 16])
title('Quantization of signal x');
legend('Original signal','Quantized signal');
xlabel('Time (s)');
ylabel('Amplitude');

```

Figures:



