

INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY
BANGALORE

PRINCIPLES OF COMMUNICATIONS
EC 303P

Lab: 1

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Question 1

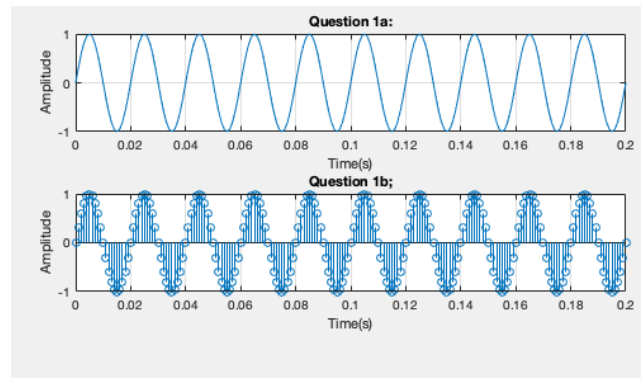


Figure 1: Question 1a and 1b.

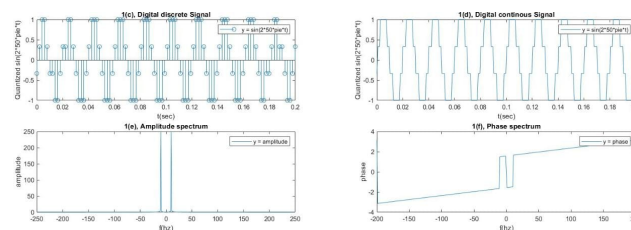


Figure 2: Question 1c ,1d and 1e.

a:

```
f = 60;
t = 0 : 0.001 : 0.2;
y = sin(2*pi*f*t);
subplot(3,1,1);
plot(t,y);
xlabel('Time(s)')ylabel('Amplitude')
title('Question:1a')
grid on;
```

b:

```
y = sin(2*pi*f*t);
subplot(3,1,2);
stem(t,y);
xlabel('Time(s)')ylabel('Amplitude')
title('Question:1b')
grid on;
```

c:

```
subplot(4,1,1)
y0 = sin(200*pi*x);
x = linspace(0,0.6);
b = [-2/3,0,2/3];
a = [-1,-1/3,1/3,1];
[i,q] = quantiz(y0,b,a);
stem(x,q);
```

```

grid on
xlabel('Time (s)')ylabel('Amplitude')
title('1(c) (i). digital discrete-time signal')

```

```

subplot(4,1,2)
y3 = sin(200*pi*x);
x = linspace(0,0.8);
b = [-2/3,0,2/3];
a = [-1,-1/3,1/3,1];
[i,q] = quantiz(y3,b,a);
plot(x,q);
grid on
xlabel('Time (s)')
ylabel('x(t)')
title('1(c) (b). digital Analog-time signal')

```

d:

```

subplot(4,1,3)
y2 = fft(sin(2*50*pi*x));
plot(x,abs(y2))
grid on
xlabel('Time (s)')
ylabel('Amplitude spectrum')
title('1(d). Amplitude spectrum')

```

e:

```

subplot(4,1,4)
y2 = fft(sin(2*50*pi*x));
plot(x,angle(y2))
grid on
xlabel('Time (s)')
ylabel('Phase spectrum')
title('1(e). Phase spectrum')

```

Question 2

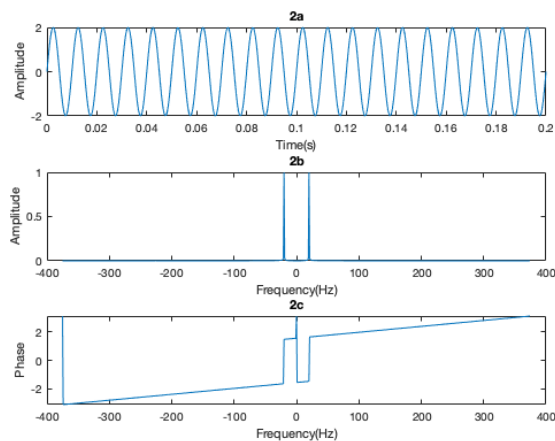


Figure 3: Question 2.

a:

a:

```
subplot(3,1,1);  
fs = 750;  
t = linspace(0,0.2,750);  
x = 2*sin(200*pi*t);  
plot(t,x)  
xlabel("Time(s)")  
ylabel("Amplitude")  
title("2a")
```

b:

```
subplot(3,1,2);  
xfft = fft(x);  
xfft = fftshift(xfft);  
xamp = abs(xfft)/length(x);  
freq = -fs/2:fs/2-1;  
plot(freq,xamp);  
xlabel("Frequency(Hz)")  
ylabel("Amplitude")  
title("2b")
```

c:

```
subplot(3,1,3);  
xangle = angle(fftshift(fft(x)));  
freq = -fs/2:fs/2-1;  
plot(freq,xangle);  
xlabel("Frequency(Hz)")  
ylabel("Phase")  
title("2c")
```

Question 3

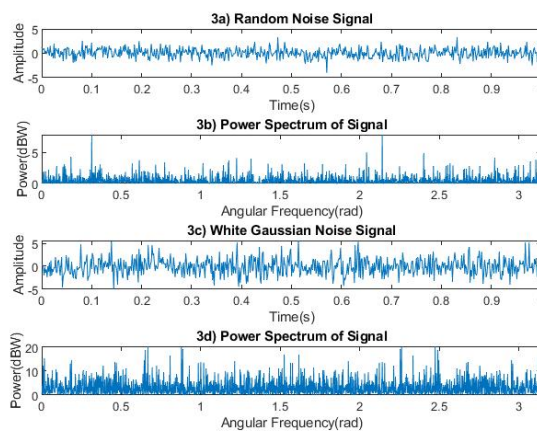


Figure 4: Question 3.

a:

```
N=2500;
t=(-N/2:N/2-1)/N;
subplot(4,1,1);

y=randn(size(t));
n=length(y);
Y=fftshift(y);
f=(0:n-1)*(N/n);
plot(f*pi/N,y);
temp=(abs(Y).^2/n);
xlim([0 1])
xlabel("Time(s)") ylabel("Amplitude")
title("3a) Random Noise Signal")

subplot(4,1,2);
plot(f*pi/N,Pyy*1000);
xlim([0 pi])
xlabel("Angular Frequency(rad)") ylabel("Power(dBW)")
title("3b) Power Spectrum of Signal")
```

b:

```
subplot(4,1,3);
y2=wgn(N,1,5);
plot(f*pi/N,y1);
xlim([0 1])
title("3c) White Gaussian Noise Signal")
xlabel("Time(s)") ylabel("Amplitude")

temp=abs(Y1).^2/N;
disp(var(y1));
subplot(4,1,4);
y2=fft(y1,N);
disp(mean(temp))
plot(f*pi/N,temp);
xlabel("Angular Frequency(rad)") ylabel("Power(dBW)")
title("3d) Power Spectrum of Signal")
```