

PRE LAB#4

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Note that all of the functions are at the end of the report...

Q1)

```
bit_gen(5,4)
```

```
ans = 5x4
      0      0      1      1
      1      0      0      1
      1      1      1      0
      0      1      1      1
      1      1      1      0
```

Q2)

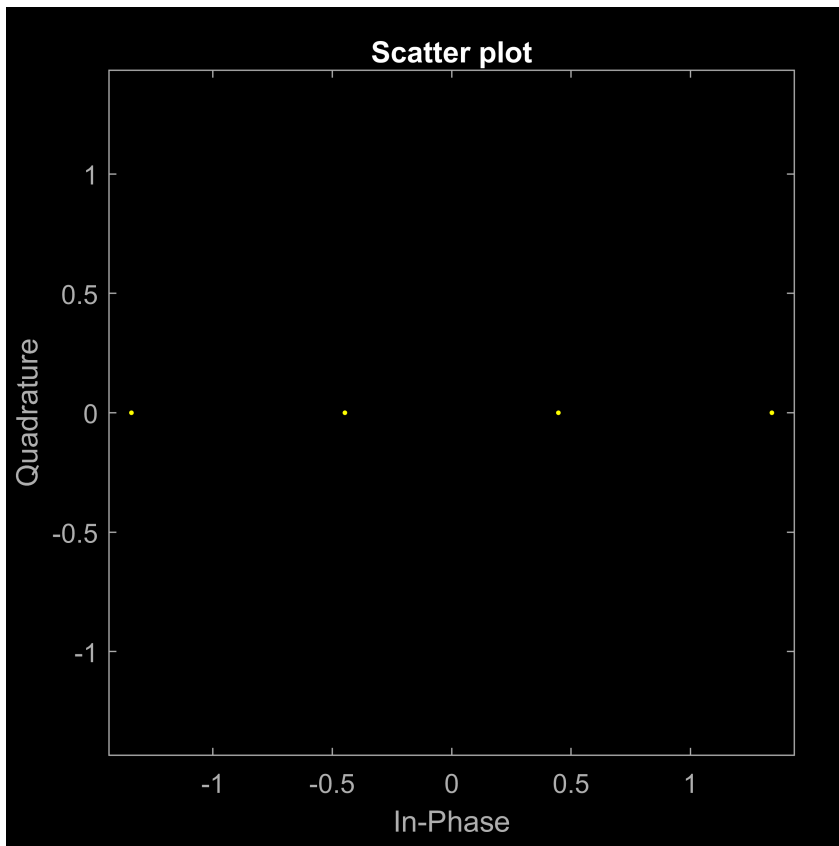
```
[cons4, Es_avg] = constellation(4, 'pam')
```

```
cons4 = 4x1
      -1.3416
      -0.4472
       0.4472
       1.3416
Es_avg = 1
```

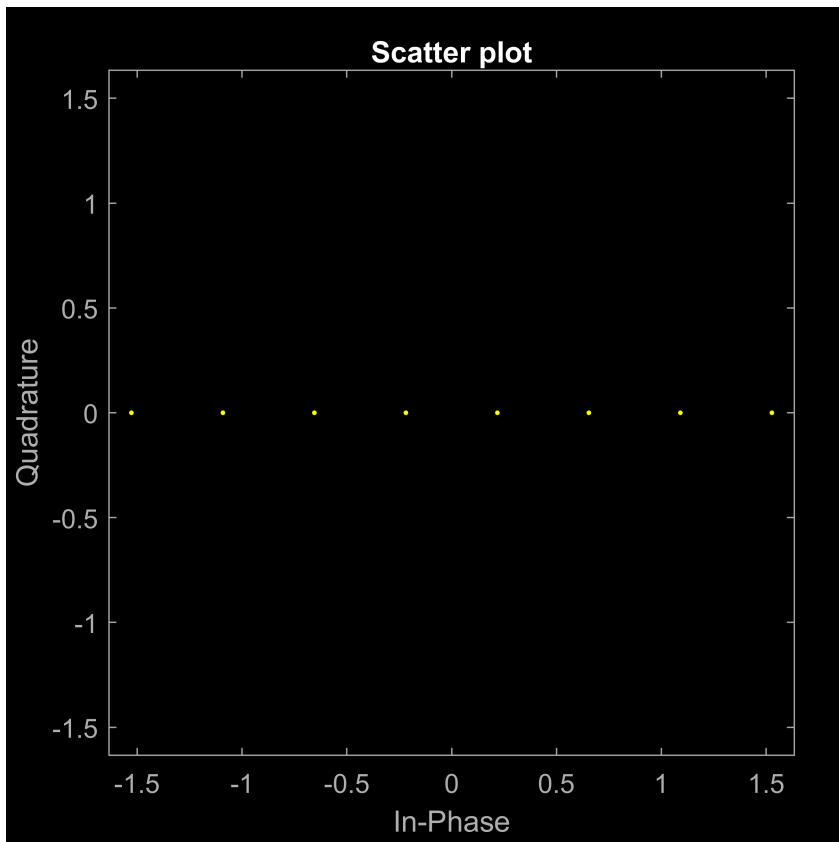
```
[cons8, Es_avg] = constellation(8, 'pam')
```

```
cons8 = 8x1
      -1.5275
      -1.0911
      -0.6547
      -0.2182
       0.2182
       0.6547
       1.0911
       1.5275
Es_avg = 1.0000
```

```
scatterplot(cons4)
```

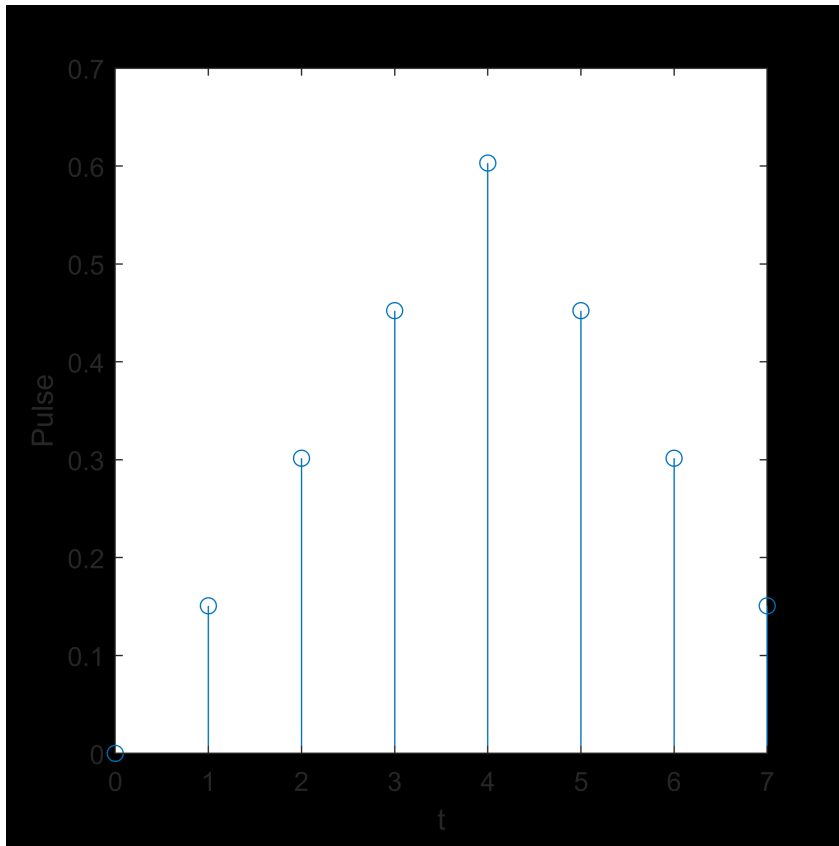


```
scatterplot(cons8)
```

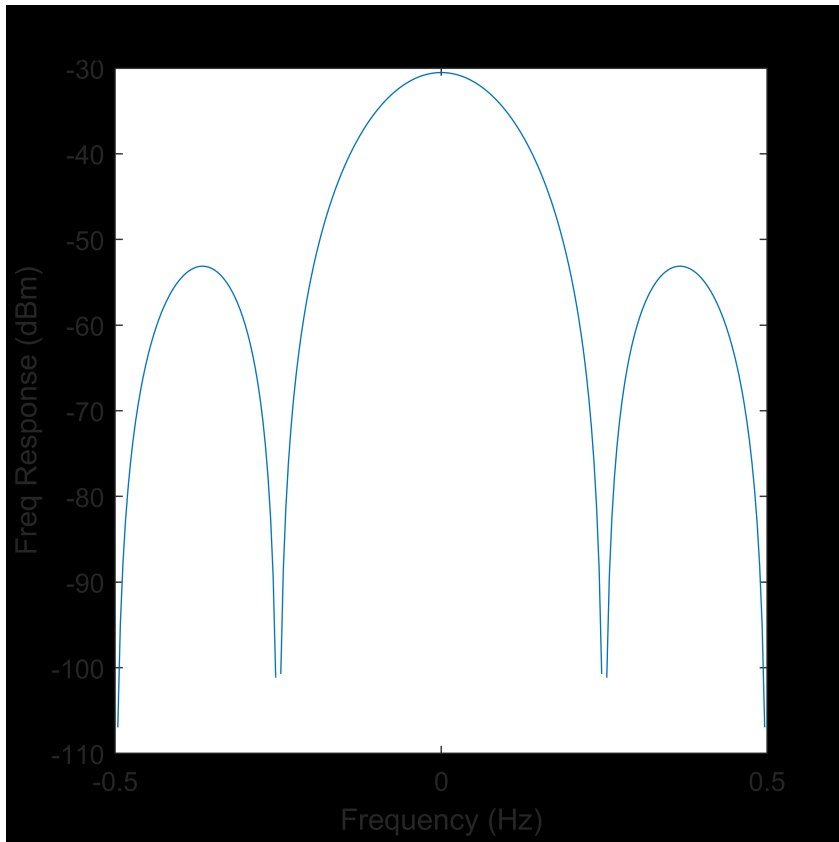


Q3)

```
fs = 1;  
smp1_per_symb1 = 8;  
n_fft = 256;  
[p, t] = pulse_shape('triangular', fs, smp1_per_symb1);  
stem(t,p)  
title('Pulse Shape')  
xlabel('t')  
ylabel('Pulse')
```



```
[s, freq] = Freq_res_db(p, fs, n_fft);  
plot(freq, s)  
title('Frequency response in dB of Rectangular Pulse Shape')  
xlabel('Frequency (Hz)')  
ylabel('Freq Response (dBm)')
```



Functions.

```
function [b] = bit_gen(N,k)
b = randi([0 1],N,k);
end

function [cons, Es_avg] = constellation(M, modulation)
switch modulation
case 'pam'
    m = transpose(1:M);
    cons = 2 * m - 1 - M;
    Es_avg = mean(abs(cons).^2);
    cons = cons / sqrt(Es_avg);
    Es_avg = mean(abs(cons).^2);
end
end

function [p, t] = pulse_shape(pulse_name, fs, smpl_per_syml, varargin)
t = transpose(0:1/fs:(smpl_per_syml-1)/fs);
Ts = smpl_per_syml/fs;
switch pulse_name
case 'triangular'
    p = max((Ts/2)-abs(t-(Ts/2)), 0);
    p = p / sqrt(sum(abs(p).^2));
end
end
```

end

```
function [s, freq] = Freq_res_db(x, fs, n_fft)
freq = transpose((0:n_fft-1)/n_fft * fs - fs/2);
Xf = fftshift(fft(x, n_fft))/n_fft;
R = 50;
s = 10 * log10(abs(Xf).^2/(2*R)) + 30;
end
```