NAME: RAUNAK SHARAMA

ID: 2018A3PS0377P

SECTION - 1

**TASK-1**

clc

clear all

close all

N = 10^6;

data = randi([0 1],1,N);

data\_transmission = 2\*data - 1;

data\_received = zeros(1,N);

Noise\_db = -150;

BW = 100;

noise\_power = 10^((Noise\_db/10)-3)\*BW;

Noise\_standard\_deviation = sqrt(noise\_power);

Noise = Noise\_standard\_deviation\*randn(size(data));

%Noise = Noise';

P = 1e-24;

signal\_power = [];

ber\_function = [];

bit\_error = [];

while P <= 1e-12

transmission = sqrt(P)\*data\_transmission;

received = transmission + Noise;

for i = 1:N

if received(i)>=0

data\_received(i) = 1;

else

data\_received(i) = 0;

end

end

[dummy,ratio] = biterr(data\_received,data);

bit\_error = [bit\_error ratio];

signal\_power = [signal\_power 10\*log10(P)];

ber\_function = [ber\_function

qfunc(sqrt(P/noise\_power))];

P = P\*10;

end

scatterplot(transmission,[],[]);

title('Transmitted Signal')

scatterplot(received,[],[]);

title('received Signal')

figure(3)

plot(signal\_power,bit\_error)

hold on

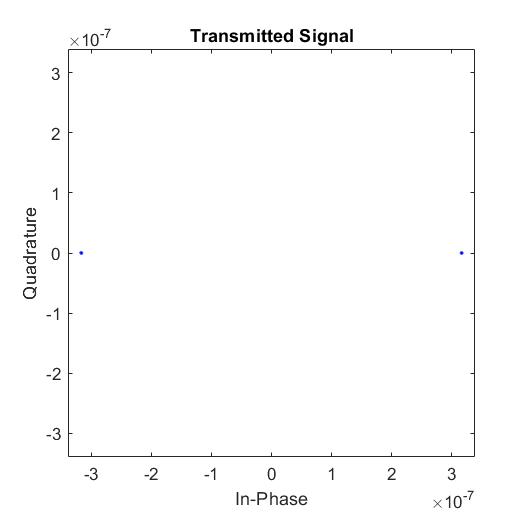
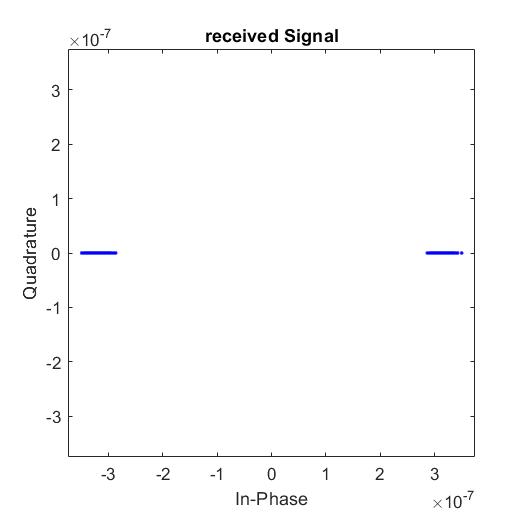
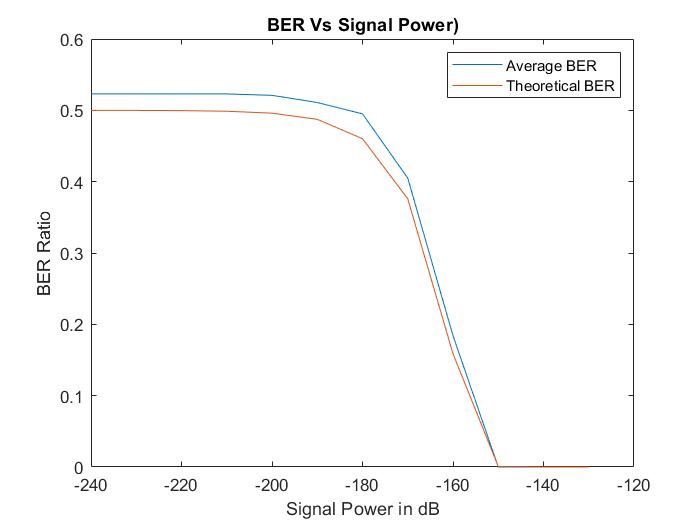
plot(signal\_power,ber\_function)

legend('Average BER','Theoretical BER')

xlabel('Signal Power in dB')

ylabel('BER Ratio')

title('BER Vs Signal Power)');



**Task-2**

clc

clear all

close all

N=10^6;

alpha = 1e-3;

data = randi([0 1],1,N);

data\_transmission = 2\*data - 1;

data\_received = zeros(1,N);

Noise\_db = -150;

BW = 100;

noise\_power = 10^((Noise\_db/10)-3)\*BW;

Noise\_standard\_deviation = sqrt(noise\_power);

Noise = Noise\_standard\_deviation\*randn(size(data));

%Noise = Noise';

P = 1e-24;

signal\_power = [];

ber\_function = [];

bit\_error = [];

while P <= 1e-8

transmission = alpha\*sqrt(P)\*data\_transmission;

received = transmission + Noise;

for i = 1:N

if received(i)>=0

data\_received(i) = 1;

else

data\_received(i) = 0;

end

end

[dummy,ratio] = biterr(data\_received,data);

bit\_error = [bit\_error ratio];

signal\_power = [signal\_power 10\*log10(P)];

ber\_function = [ber\_function

qfunc(sqrt(P/noise\_power))];

P = P\*10;

end

scatterplot(transmission,[],[]);

title('Transmitted Signal')

scatterplot(received,[],[]);

title('received Signal')

figure(3)

plot(signal\_power,bit\_error)

hold on

plot(signal\_power,ber\_function)

legend('Average BER','Theoretical BER')

xlabel('Signal Power in dB')

ylabel('BER Ratio')

title('BER Vs Signal Power, with channel coefficient of 10^(-3)');

