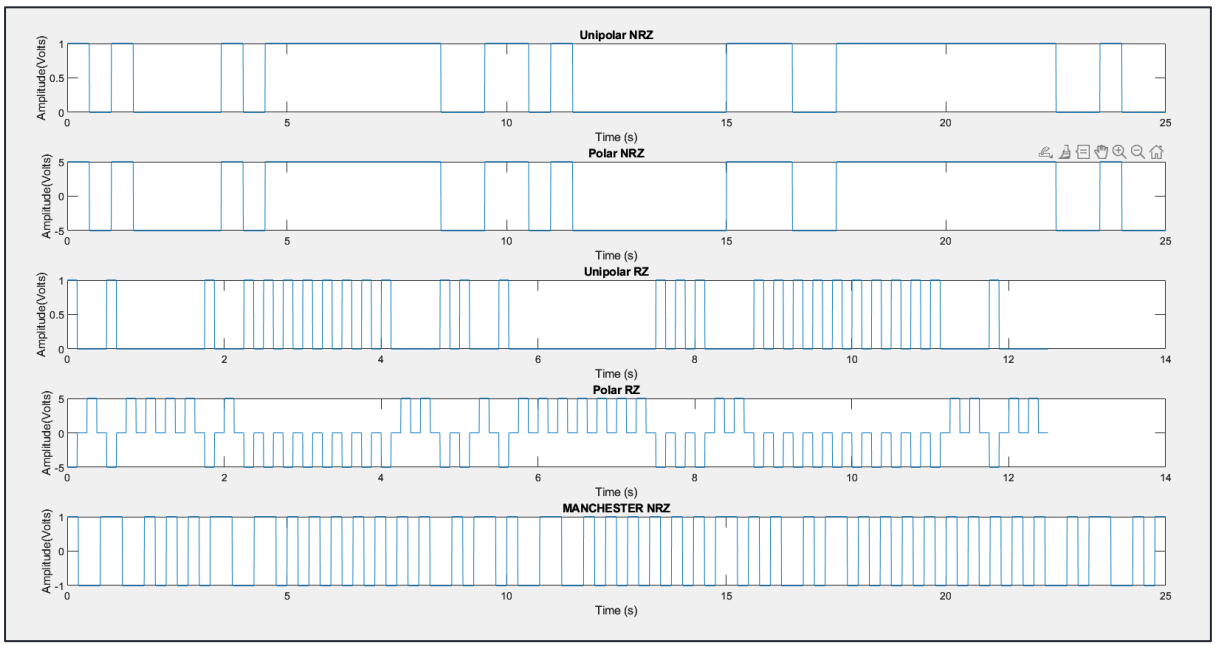
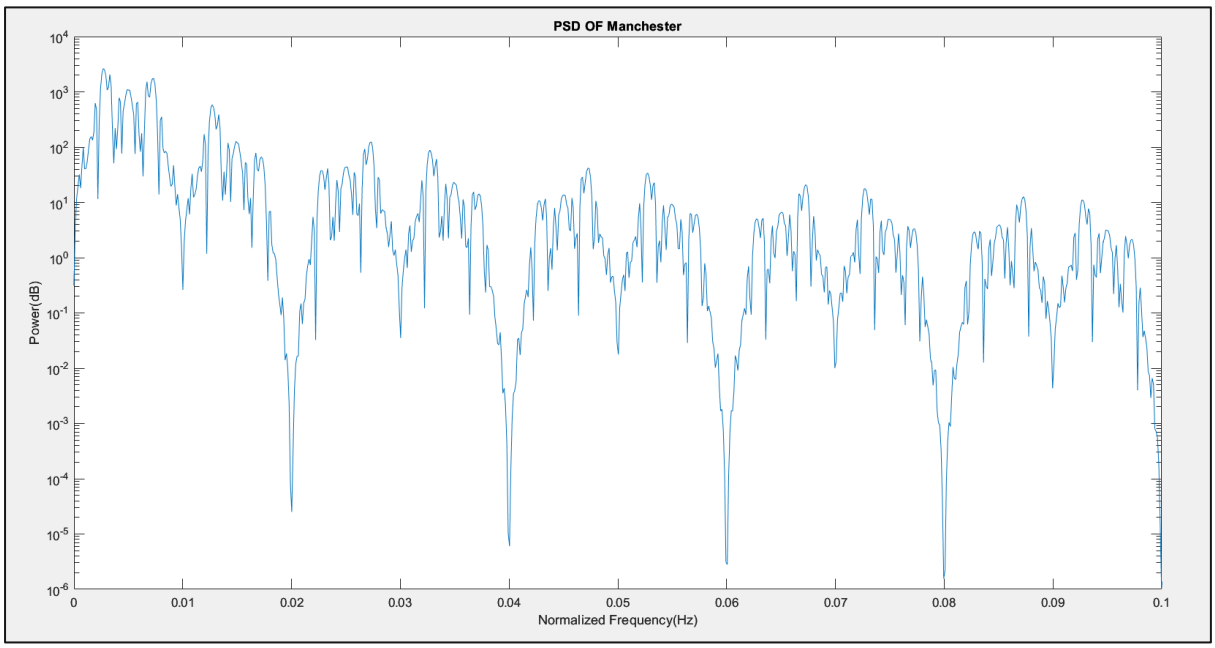
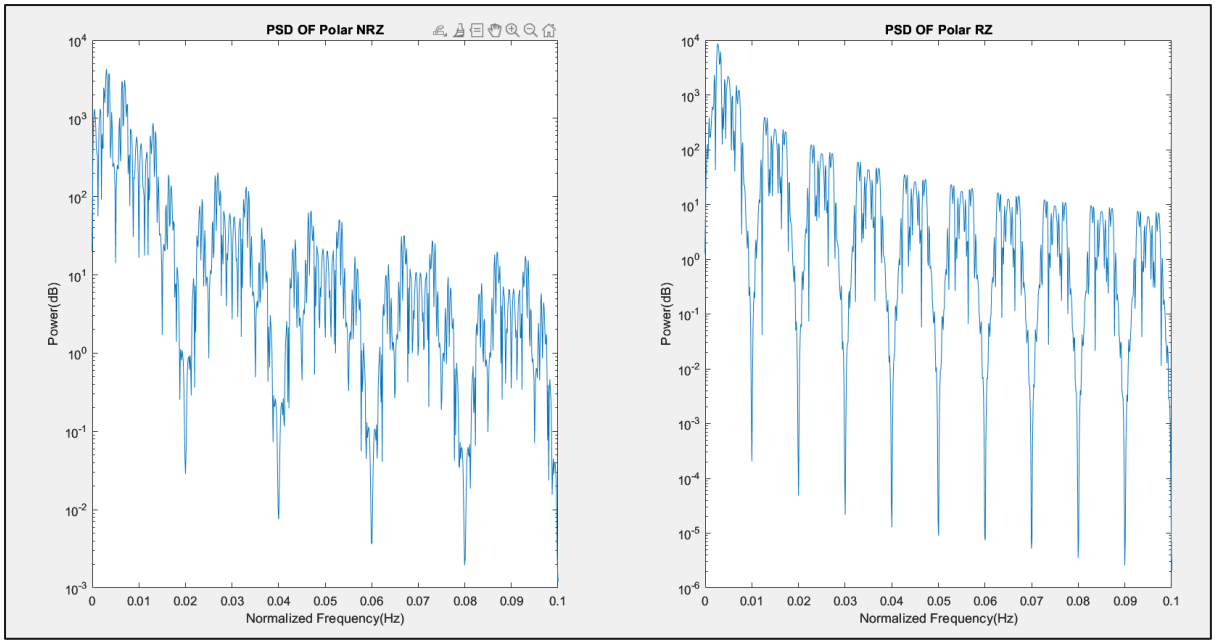
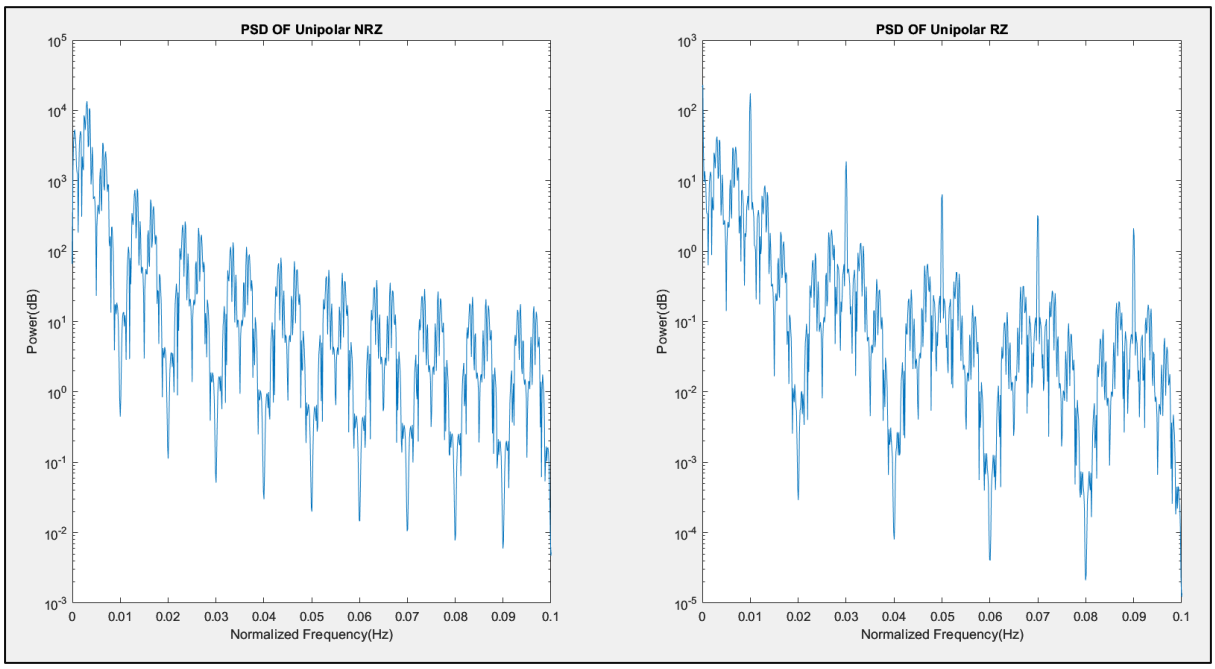
```
clc;
close all;
x = randi([0, 1], 1, 50); % bit stream (generate random bits)
y = [];
a = [];
z = 0;
N = length(x);
tb = length(x)/100;
tb2 = length(x)/200;
% unipolar NRZ
for i = 1:length(x)
    if x(i) == 1
        y = [y ones(1,100)];
    else
        y = [y zeros(1,100)];
    end
end
t = tb/100 : tb/100 : N*tb;
figure
subplot(5,1,1)
plot(t,y)
title("Unipolar NRZ")
xlabel('Time (s)')
ylabel('Amplitude(Volts)')
% polar NRZ
y1 = [];
for i = 1:length(x)
    if x(i) == 1
        y1 = [y1 5*ones(1,100)];
    else
        y1 = [y1 -5*ones(1,100)];
    end
end
t = tb/100 : tb/100 : N*tb;
subplot(5,1,2)
plot(t,y1)
title("Polar NRZ")
xlabel('Time (s)')
ylabel('Amplitude(Volts)')
% unipolar RZ
y2 = [];
for i = 1:length(x)
    if x(i) == 1
        y2 = [y2 ones(1,50) zeros(1,50)];
    else
        y2 = [y2 zeros(1,100)];
    end
end
t1 = tb/(2*(100)) : tb/(2*(100)) : N*tb/2;
subplot(5,1,3)
plot(t1,y2)
title("Unipolar RZ")
xlabel('Time (s)')
ylabel('Amplitude(Volts)')
% polar RZ
y3 = [];
for i = 1:length(x)
    if x(i) == 0
        y3 = [y3 5*ones(1,50) zeros(1,50)];
```

```
    else
        y3 = [y3 -5*ones(1,50) zeros(1,50)];
    end
end
t = tb/(2*(100)) : tb/(2*(100)) : N*tb/2;
subplot(5,1,4)
plot(t,y3)
title("Polar RZ")
xlabel('Time (s)')
ylabel('Amplitude(Volts)')

% MANCHESTER NRZ
for i = 1:length(x)
    if x(i) == 1
        a = [a ones(1,50) -ones(1,50)];
    else
        a = [a -ones(1,50) ones(1,50)];
    end
end
t = tb/100 : tb/100 : N*tb;
subplot(5,1,5)
plot(t,a)
title("MANCHESTER NRZ")
xlabel('Time (s)')
ylabel('Amplitude(Volts)')
% Define the window for PSD estimation
w = hamming(length(y1));

[px1,f1] = pwelch(y1,w,[],[],1,'onesided');
[px2,f2] = pwelch(y2,w,[],[],1,'onesided');
[px3,f3] = pwelch(y3,w,[],[],1,'onesided');
[px4,f4] = pwelch(y4,w,[],[],1,'onesided');
[px5,f5] = pwelch(y5,w,[],[],1,'onesided');
[px7,f7] = pwelch(y,w,[],[],1,'onesided');
figure
subplot(1,2,1);
semilogy(f1,px1,'DisplayName','Unipolar-NRZ');xlim([0 0.1]);
ylabel("Power(dB)");xlabel("Normalized Frequency(Hz)");
title("PSD OF Unipolar NRZ");
subplot(1,2,2);
semilogy(f2,px2,'DisplayName','Unipolar-RZ');
xlim([0 0.1]);
ylabel("Power(dB)");xlabel("Normalized Frequency(Hz)");
title("PSD OF Unipolar RZ");

figure
subplot(1,2,1);
semilogy(f3,px3,'DisplayName','Polar-NRZ');xlim([0 0.1]);
ylabel("Power(dB)");xlabel("Normalized Frequency(Hz)");
title("PSD OF Polar NRZ");
subplot(1,2,2);
semilogy(f4,px4,'DisplayName','Polar RZ');xlim([0 0.1]);
ylabel("Power(dB)");xlabel("Normalized Frequency(Hz)");
title("PSD OF Polar RZ");

figure
semilogy(f5,px5,'DisplayName','Manchester');xlim([0 0.1]);
ylabel("Power(dB)");xlabel("Normalized Frequency(Hz)");
title("PSD OF Manchester");
```


Unipolar NRZ
Amplitude(Volts)
Time (s)
Polar NRZ
Amplitude(Volts)
Time (s)
Unipolar RZ
Amplitude(Volts)
Time (s)
Polar RZ
Amplitude(Volts)
Time (s)
MANCHESTER NRZ
Amplitude(Volts)
Time (s)


PSD OF Manchester
Power(dB)
Normalized Frequency(Hz)


PSD OF Polar NRZ
Power(dB)
Normalized Frequency(Hz)
PSD OF Polar RZ
Power(dB)
Normalized Frequency(Hz)


PSD OF Unipolar NRZ
Power(dB)
Normalized Frequency(Hz)
PSD OF Unipolar RZ
Power(dB)
Normalized Frequency(Hz)