

**NAME: OYEWUMI VICTOR OLUMIDE**  
**MATRIC NUMBER: 22/ENG02/082**  
**DEPARTMENT: COMPUTER ENGINEERING**  
**EEE 328**

### **ASSIGNMENT 1**

- Generate random signals
- Convert the random signals into binary data
- Modulate the generated data into binary phase
- Multiply the result in 3 by the channel state information
- Add noise to the resultant signal in 4
- Demodulate the signal
- Plot the graph of 3 and 6

### **MATLAB CODE**

```
clc;
clear;

%% Step 1: Generate 100 random signals
numBits = 100;
randomSignal = rand(1, numBits);

%% Step 2: Convert the random signals into binary data
binaryData = randomSignal > 0.5;

%% Step 3: Modulate the binary data into BPSK
bpskModulated = 2 * binaryData - 1;
disp('Step 3: BPSK Modulated Symbols:');
disp(bpskModulated);

%% Step 4: Multiply by channel state information
h = (randn(1, numBits) + 1i * randn(1, numBits)) / sqrt(2);
channelOutput = bpskModulated .* h;

%% Step 5: Add noise
SNR_dB = 10;
SNR_linear = 10^(SNR_dB / 10);
noisePower = 1 / SNR_linear;
noise = sqrt(noisePower / 2) * (randn(1, numBits) + 1i * randn(1, numBits));
receivedSignal = channelOutput + noise;
disp('Step 5: Received Signal with Noise:');
disp(receivedSignal);

%% Step 6: Demodulate the signal
equalizedSignal = receivedSignal ./ h;
demodulatedBits = real(equalizedSignal) > 0;
bpskDemodulated = 2 * demodulatedBits - 1;
disp('Step 6: Demodulated BPSK Symbols:');
disp(bpskDemodulated);

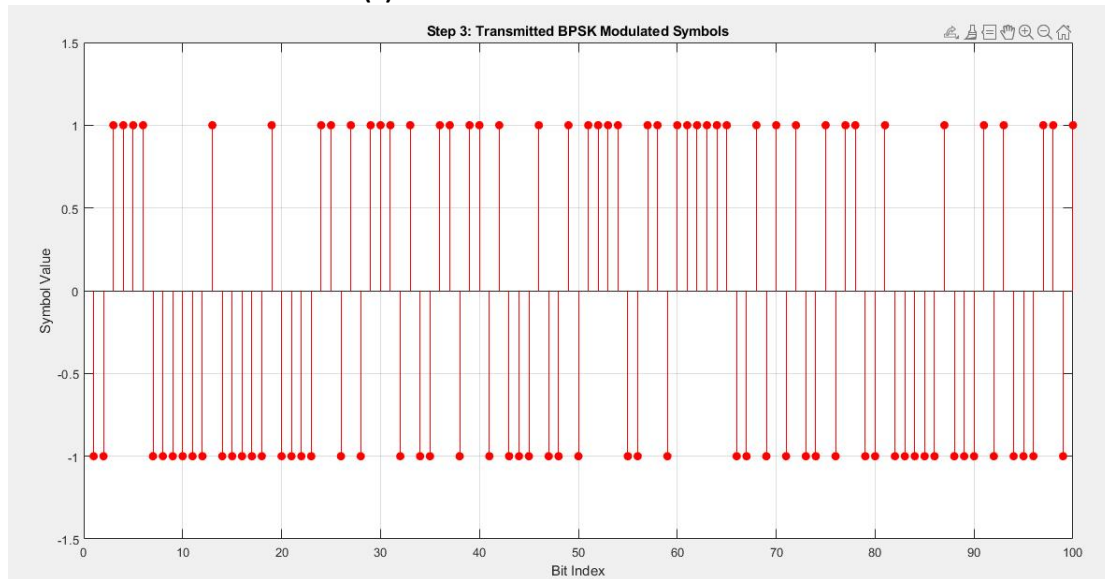
%% Step 7a: Plot Transmitted BPSK Symbols (Step 3)
figure;
stem(1:numBits, bpskModulated, 'r', 'filled');
title('Step 3: Transmitted BPSK Modulated Symbols');
xlabel('Bit Index');
ylabel('Symbol Value');
ylim([-1.5 1.5]);
grid on;

%% Step 7b: Plot Received Signal with Noise (Step 5)
figure;
plot(real(receivedSignal), imag(receivedSignal), 'bo');
title('Step 5: Received Signal with Noise (Complex Plane)');
xlabel('Real Part');
ylabel('Imaginary Part');
grid on;
axis equal;

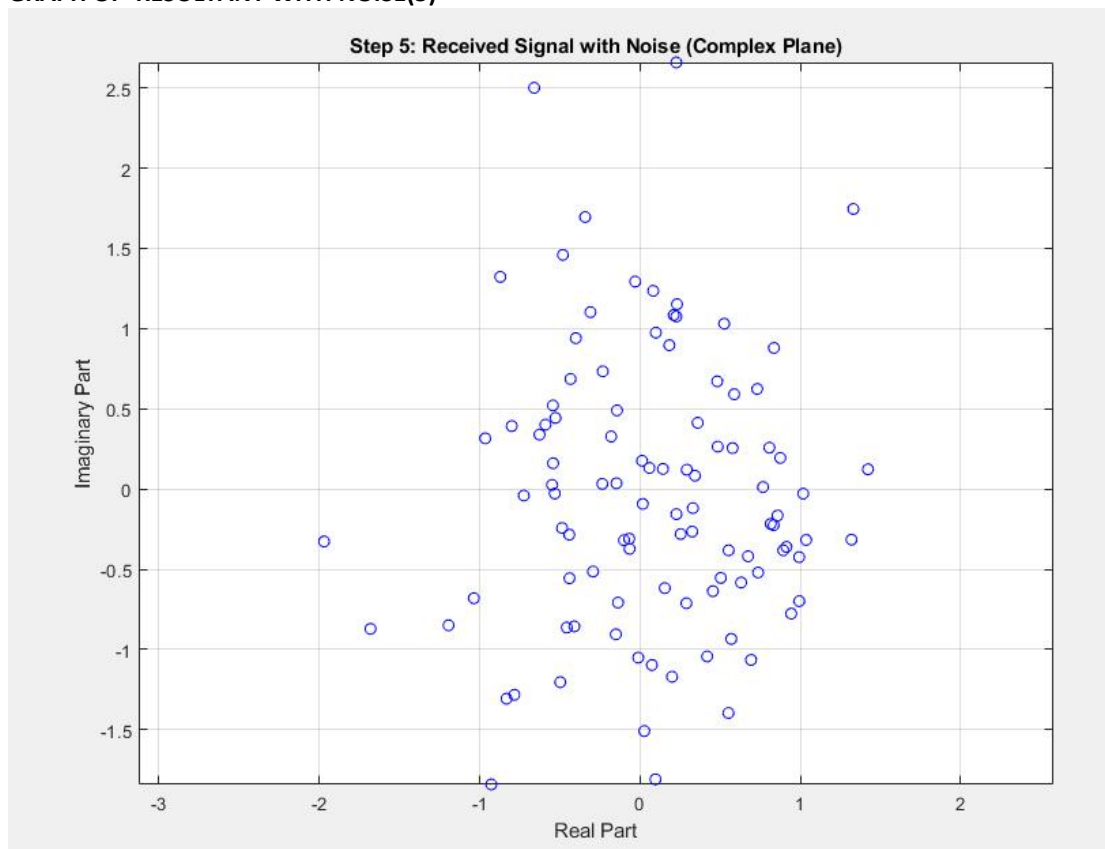
%% Step 7c: Plot Demodulated BPSK Symbols (Step 6)
figure;
stem(1:numBits, bpskDemodulated, 'b', 'filled');
title('Step 6: Demodulated BPSK Symbols');
xlabel('Bit Index');
ylabel('Symbol Value');
ylim([-1.5 1.5]);
grid on;
```

## GRAPHS

### GRAPH OF MODULATED SIGNAL(3)



### GRAPH OF RESULTANT WITH NOISE(5)



### GRAPH OF DEMODULATED SIGNAL(6)

