CT Assignment-6

Simulation Report:

PART-1:

Question-1:

We have used **Monte Carlo Simulation** to generate 100 samples and plot them. The corresponding plots for different variances(sigma).

Chart

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Chart, scatter chart

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Chart, scatter chart

Description automatically generated

1. We can use binary orthogonal detector with MAP rule for this kind of binary communication.
2. As we increase the variance the SNR value decreases as a result the symbols plotted are distributed over more area than a single point.

PART-2:

Question-1: In this question we have been asked to generate random n number of bits using the random generator using the bits {0,1}.

Question-2: In this question we have been asked to write the functions for different constellations using gray code. BPSK,QPSK,4PAM,16QAM,8PSK.

Question-3: In this question we have been asked to map the generated bits to BPSK and then transmit through a filter and receive to get noiseless samples.

Question-4: In this question like the previous question, we have to add noise to the signal we have transmitted to get noisy version of the obtained signal at the receiver.

Question-5: In this question we must plot the idea; bit rate error over a range of 10 dB and find the value of Eb/N0 for which the probability of error is 0.01. The value of Eb/N0 we get from the plot below is 4.32.

Chart

Description automatically generated

Question-6: We have been asked to plot the decision statistics(real and imaginary) for BPSK.

Parameters: Eb/N0 = 4.33. variance = 0.184

Chart

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Question-7: In this question we must find the bit error probabilities at the receiver output and inputs and compare that with the ideal bit error.

The bit error at input is 0.0240 and at the output is 0.070 and the ideal bit error is 0.01.

Question-8: Here we must find the bit error probability of 4PAM constellation and find the value of Eb/N0 where the probability of error is 0.01. Eb/N0 from the plot we get 6.31

Chart

Description automatically generated

Question-9: We take the variance value from the above questions and then determine the decision statistics and plot them. We also find the error of probability for 4PAM and QPSK.

Bit error probability of 4PAM = 0.01(ideal = 0.01)

Bit error probability of QPSK = 0.04(ideal = 0.01).

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Background pattern

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Question-10: we repeat the above parts 8 and 9 for 16QAM.

Bit error probability = 0.022 (ideal =0.01)

Chart, scatter chart

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Question-11: We repeat the parts 8 and 9 for 8PSK constellation.

The bit error probability = 0.058(ideal = 0.01)

Chart, scatter chart

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