SRM INSTITUTE OF SCIENCE AND TECHNOLOGY TIRUCHIRAPPALLI
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

21ECC302T – ANALOG AND DIGITAL COMMUNICATION

Assignment – 02

Submission Date: 09.05.2025

Module – 03

1. What is a Matched Filter? Explain how a matched filter can maximize SNR for a given transmitted symbol. Derive the Probability of error for Matched Filter.
2. Explain Pulse Code Modulation System in detail.
3. Compare PWM and PPM.
4. 24 telephone channels, each band limited to 3.8 kHz, are to be time domain multiplexed by using PCM. Calculate the bandwidth of the PCM system for 128 quantization levels and 8 kHz sampling frequency.
5. What is Quadrature Amplitude Modulation? Draw the signal constellation diagram for QAM.
6. Represent the data 10100111 by using the following line coding techniques
   (i)   Unipolar NRZ
   (ii)   Bipolar RZ
7. A continuous signal is band limited to 5kHz. The signal is quantized in 8 levels of a PCM system with the probabilities 0.25, 0.2, 0.2, 0.1, 0.1, 0.05, 0.05 and 0.05. Calculate the rate of information.
8. Elaborate the working of Pulse Code Modulation (PCM) transmitter and Receiver with neat block diagram. Also derive an expression of Signal to Quantization Noise Ratio of a PCM System.
9. Differentiate between Pulse Code Modulation and Differential Pulse Code Modulation.
10. Define the term sampling and quantization in pulse code modulation
11. Explain in detail about the Delta Modulation and detection process with its relevant sketch.
12. A PCM system uses a Uniform Quantizer followed by a 7-bit binary encoder. The bit rate of the system is equal to $50 \times 10^6 \ bits/\sec$. (i) What is the maximum message bandwidth for which the system operates satisfactorily? (ii) Determine the output signal to Quantization noise ratio when a full load sinusoidal modulating wave of frequency 1 MHz is applied to the input.

Module – 04

1. Discuss about generation, signal space diagram of QPSK.
2. Derive the Probability error of FSK and also explain the generation and detection of binary FSK.
3. Compare ASK, FSK and PSK modulation schemes with waveforms.
4. Write a neat diagram, explain the generation and detection of $\pi/4$ QPSK scheme and also obtain an expression for the error probability of QPSK.
5. Compare PSK, QPSK and $\pi/4$ QPSK modulation.
6. With a neat block diagram, explain the generation, signal space diagram and detection process in QAM.
7. Derive the expression for Maximum Likelihood Detector with neat block diagram.

Module – 05

1. With a neat block diagram explain DSSS Transmitter and Receiver
2. Explain the OFDM Communication system with neat diagram.
3. Write short notes on Shannon's Channel Capacity Theorem
4. Explain the uses of the spread spectrum in CDMA.
5. Compare and contrast slow and fast hopping systems. Also, explain the fast frequency hopping spread spectrum technique with neat diagram.
6. A source emits symbols $x_1, x_2 \dots x_7$ with respective probabilities 0.35,0.3,0.2,0.1,0.04,0.005 and 0.005. Give Huffman coding for these symbols and find the average length of the code – word.
7. Explain the working of the FHSS transmitter and receiver with neat diagram.
8. In a communication system, the source transmits five different messages say S_1, S_2, S_3, S_4, S_5 with probabilities of 0.4, 0.19, 0.16, 0.15 and 0.15 respectively. Find the code word for each message and the coding efficiency using SHANNON FANO Coding.
9. Find out the generator Matrix for a systematic $(7,4)$ cyclic code of $G(P) = P^3 + P^2 + 1$. Also find the Parity check matrix. Assume the message as 1011.
10. For a systematic Linear Block Code, the three parity check digits P_1, P_2, P_3 are given by

$$P_{4\times3} = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}.$$

(i) Construct Generator Matrix
(ii)   Construct code generated by this matrix.
(iii) Determine error correcting capability
(iv)   Decode the received words with own example.

*****