Digital Communication

IMPORTANT QUESTIONS

UNIT-1

SAQS:

1. Define sampling theorem.
2. What are the application of PCM.
3. What are the drawbacks of delta modulation and discuss the remedy.
4. What are the advantages and disadvantages of PCM.
5. What are the basic elements of PCM.
6. Explain Granular noise in DM.
7. What are the advantages and disadvantages of digital communication system?
8. What are the advantages of DM over PCM?

LAQS:

1. Calculate and determine SNR of a DM system.
2. Explain slope overload noise in DM.
3. Give the comparison between PCM, DPCM, DM and ADM.
4. Explain quantization noise in DM.
5. Explain the working of a PCM system with neat block diagram
6. Calculate the minimum number of uniform quantization levels required for speech PCM. When the signal to quantization noise is 60db and also calculate the system bandwidth required.
7. With a neat block diagram explain the working of a Digital Communication System.
8. Why digital communication system is considered superior to analog communication system? Enlist the reason.
9. Give the comparison between PCM, DPCM, DM, and ADM.
10. Explain the modulation and demodulation of DM in detail.
11. Explain the modulation and demodulation procedure in DPCM system.
12. What is quantization noise and derive the expression for the same?
13. Explain the slope overload error in DM.

UNIT-II

SAQS:

1. Define a binary symmetric channel.
2. An event has six possible outcomes with the probabilities p1=1/2, p2=1/4, p3=1/B, p4=1/16, p5=1/32, p6=1/32. Find the entropy of the system.
3. Write the properties of information.
4. Define mutual information and self-information.
5. Define Entropy of a source. If a source delivers '128' symbols what is the maximum entropy?
6. Define entropy.
7. What is Channel Capacity?
8. Explain joint and conditional entropies.
9. Define information and entropy.

LAQS:

1. A OMS X has four symbols $x_1, x_2, x_3,$ and x_4 with probabilities $p(x_1) = 1/2$; $p(x_2) = 1/4$; $p(x_3) = p(x_4) = 1/8$. Construct a Shannon Fanno code for X and calculate the code efficiency.
2. Perform the shannofano coding on the following source symbols

Symbols	S_0	S_1	S_2	S_3	S_4
Probability	0.2	0.1	0.4	0.1	0.2

I. Calculate the efficiency of the coder.
II. Explain Binary symmetric channel and calculate channel capacity.

3. Describe Binary Symmetric Channel (BSC) with channel diagram and Channel matrix. Derive the expression for channel capacity of BSC.
4. A discrete Memoryless Source delivers five symbols with probabilities of occurrence as given below:

$\mathbf{X_i}$	A	B	C	D	E
$\mathbf{P(X_i)}$	1/2	1/4	1/8	1/16	1/16

Construct a Shannon-Fanno code. Represent 'ECE' in binary. Find Entropy, Average codeword length, Coding efficiency and Redundancy.

5. Apply Shannon fano coding for following message ensemble.

[X]	X1	X2	X3	X4	X5	X6	X7	X8
[P]	1/4	1/8	1/16	1/16	1/16	1/4	1/16	1/8

Explain binary symmetric channel and calculate channel capacity.

UNIT-III

SAQS:

1. Why the binary cyclic codes are attractive over linear block codes?
2. Define weight and distance for a linear block code.
3. What is syndrome?
4. In LBC, relate minimum distance and detectable and correctable errors.
5. Explain the need for error control coding?
6. What is the need for source coding?
7. The generator matrix for (6,3) block code is i= $\begin{bmatrix} 100 & 011 \\ 010 & 101 \\ 101 & 110 \end{bmatrix}$. find the code vector for message block (1,0,1).
8. What is the need for error control codes?

LAQS:

1. List the advantages of convolutional codes over linear block codes.
2. The generator polynomial of a (7,4) cyclic code is $g(x) = 1+X+X^3$, find the code words in systematic method for the message vectors 1010, 1100 and 1101.
3. Consider a (7,4) linear block code whose generator matrix is given below

$$G = \begin{matrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 \end{matrix}$$

   i. Find code vector of this code.
   ii. Find the parity check matrix of this code.
   iii. Find minimum weight of this code.

4. Write error detection and error correction capabilities of LBC.
5. Distinguish between Cyclic codes and Convolutional codes.
6. Generator matrix of a (6,3) linear block code is given by

$$G = \begin{matrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{matrix}$$

   i. Find all the code vectors of this code.
   ii. Find the parity check matrix, minimum weight, minimum distance
   iii. Discuss error detecting and correcting capabilities of this code. If the received code word is 101100, calculate the syndrome and correct the error.

7. Consider a (7,4) LBC whose generator matrix is given below:

$$G = \begin{matrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 \end{matrix}$$

i. Find the code vector of message block $[1 \quad 1 \quad 0 \quad 0]$
ii. Write the parity check matrix H for the code.

8. The parity check bits of a (8, 4) block code are given by

C1 = m1+m2+m3

C2 =m1+m2+m3

C3 = m1+m3+m4

C1 = m2+m3+m4

Here m1, m2, m3 are message bits

i. The generator matrix and parity check matrix for this code.
ii. Find the minimum weight of this code.
iii. Find error defecting capabilities of this code.

9. What are code trees, code trellis and state diagrams for convolution encodes.

UNIT-IV

SAQS:

1. Explain the principle of DPSK demodulator.
2. How is M-ary Signaling different from Binary Signaling?
3. Calculate the probability error for a ASK scheme.
4. Write a short note on eye pattern.
5. Give the importance of Matched Filter
6. What are the different types of transmission errors?
7. Define Probability of error and give the expression for Minimum Gaussian Probability of error.
8. What is M-ary Signaling?
9. Explain the principle of DPSK demodulator.
10. Differentiate between PSK and QPSK.
11. What is correlation receiver and explain.

LAQS:

1. Explain the generation and detection of ASK with block diagrams.
2. With the help of block diagrams explain the generation and detection of QPSK signal.

3. What is meant by M-ary signaling? What are the advantages and disadvantages of M-ary signaling over binary signaling?
4. Explain with neat block diagram modulation and demodulation of QPSK
5. Compare different digital modulation schemes.
6. Explain ASK signal generation and detection with a block diagram.
7. Explain the differentially coherent PSK with neat block diagram using an example.
8. Explain the modulation and demodulation of QPSK Signal.
9. Calculate probability of error for a ASK scheme.
10. Explain the coherent FSK with transmitter and receiver block diagram.
11. Obtain the expression for probability of error of coherent FSK.
12. Explain about M-ary signaling schemes.

UNIT-V

SAQS:

1. What is FH-SS signal?
2. List the application of spread spectrum.
3. Write application of FHSS system.
4. List out the application of the spread spectrum communication.
5. Distinguish between slow and fast frequency hopping.
6. Draw the block diagram of frequency hopping spread spectrum system.
7. List the advantages of spread spectrum.
8. What is the necessity of spread spectrum?
9. Differentiate between fast and slow frequency hopping.

LAQS:

1. Write a short note on PN sequence.
2. Explain the acquisition of DS-SS signals using block diagram.
3. List the application of DS-SS and FH-SS systems.
4. Explain DS spread spectrum system with the help of block diagrams.
5. Write a short note on characteristics of PN sequences.
6. With a neat diagram explain frequency hopping spread spectrum technique.
7. What are the application of spread spectrum technique? List out the advantages and disadvantages of spread spectrum.
8. Explain in detail coarse acquisition of a direct sequences spread spectrum signal.