QP Code : 588301

(3 Hours) [Total Marks : 80

N.B.: (1) Question **No 1** is **compulsory.**

(2) Attempt any **three** questions out of remaining **five**.

(3) All questions earry **equal marks.**

(4) Assume Suitable data, if required and state it clearly.

1. Attempt **any Four** :-

   (a) Compare systematic and nonsystematic codes. 5

   (b) How is spread spectram signal different from normal signal? 5

   (c) Derive the expression for entropy? When is entropy maximum? 5

   (d) Explain QPSK is better than PSK? 5

   (e) Write short note on Optimal filter. 5

2. (a) A discrete memory less source has an alphabet of five symbol with their 10
   probabilities as shown in

Symbol	m_1	m_2	m_3	m_4	m_5
Probability	0.4	0.19	0.16	0.15	0.10

   Construct a shanon Fano code for the source and calculate code efficiency, redundancy of the code. Repeat same for the Huffman source coding technique.

   (b) Explain the meaning of equalizer. How is equalization achieved? With the 10
   help of neat block diagram explain tapped delay line equalizer.

3. (a) State and explain maximum likelihood decision rule. Explain the function 10
   of correlator receiver.

   (b) State and explain the condition for orthogonality of the BFSK signal 10
   determine its spectrum and hence bandwidth requirement for transmission
   of signal.

4. (a) Draw the signal space diagram of 16-QASK and calculate the Euclidean 10
   and compare with 16-PSK.

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(b) A generator matrix of (6,3) linear block code is given by 10

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

Determine
1. All the code vectors.
2. "d_{min}" for the above code.
3. Error detection and correction capability.
4. If the received sequence is 101101, determine the message bit sequence.

5. (a) Sketch the encoder and syndrome calculator for the generator polynomial 10
   $g(x) = 1 + X^2 + X^3$ and obtain the syndrome for the received codeword 1001011.

   (b) Generator vectors for a rate 1/3 convolution encoder are : 10
   $g_1 = (101)$, $g_2 = (100)$, $g_3 = (111)$.
   Draw Encoder diagram, trellis diagram, using trellis find code vector if message vector is (101100).

6. (a) Draw the block diagram for FH-SS system and explain the working. 10
   Differentiate between slow frequency hopping and fast frequency hopping.

   (b) Draw the block diagram of QPSK transmitter and receiver and sketch the 10
   waveform.

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