

TE - sem - VI (CBCGS) EN TC - Digital Communication. 23/11/16

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 carry **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 spectrum 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 probabilities as shown in 10

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 help of neat block diagram explain tapped delay line equalizer. 10

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

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

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

[ TRUN OVER

123-1

QP Code : 588301

- 2 -

- (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  $g(x) = 1 + X^2 + X^3$  and obtain the syndrome for the received codeword 1001011. 10
- (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 waveform. 10

---

123-2