TE sem V CBGS Etrx 11/12/15
DIGITAL COMMUNICATION

QP Code : 5731

(3 hours) Total marks : 80

N.B. : 1) Question no. 1 is compulsory
2) Attempt **any three** questions out of the remaining five questions
3) Assume suitable data if required, stating them clearly.

Q. 1 **Answer the following questions: (any four)** (20)

(a) State Shannon s theorem for Channel capacity. State Shannon's limit.
(b) What is ISI ? How is it caused? Compare ISI with ICI.
(c) What is a Matched Filter? List the properties of Matched filter.
(d) Sketch the BPSK and DPSK waveforms for the data stream given by 1100011101110 .
(e) What are the desirable properties of Line codes? Explain atleast five.

Q 2 (a) A discrete memory less source emits six messages with their probabilities as shown below: (10)

Symbol	S1	S2	S3	S4	S5	S6
Probability	0.11	0.13	0.16	0.31	0.23	0.06

(i) Using Huffman Code , find the Entropy of the source. Obtain the compact binary code and find the Average length of the Code, Code Efficiency and Code Redundancy
(ii) determine the above parameters for Shannon-Fano code

(b) Explain Duo binary encoder- decoder with a neat sketch. What is the significance of Precoder in it.? Using Precoder, show that the input bit sequence 11011001 can be properly recovered at the receiver. (10)

Q.3 (a) Answer the following briefly: (any three) (12)

(i) Compare OQPSK and MSK
(ii) Explain the Significance of Equalizer in digital communication system
(iii) Why MSK is called 'shaped QPSK'?
(iv) compare Linear block code and convolutional codes.

(b) Consider a Systematic block code whose Parity check equations are:

$p_1 = m_1 + m_3 + m_4$
$p_2 = m_1 + m_2 + m_4$
$p_3 = m_1 + m_2 + m_3$
$p_4 = m_2 + m_3 + m_4$ where m_i are message bits and p_i are parity check bits.

(i) find the value of n, k, as well as 'G' and 'H' matrices for this code.
(ii) find the codewords for the msg vectors : 1001, 1101
(iii) how many errors can the code correct and detect?
(iv) If the received codeword is 10011101, find the syndrome. (8)

Q.4 (a) With reference to 8-PSK, explain the following:
(i) transmitter and receiver with a neat block diagram along with mathematical expression for transmitted signal
(ii) Compare it with QPSK and BPSK
(iii) sketch its PSD indicating the bandwidth
(iv) draw its constellation diagram and find its Euclidian distance (3+3+2+2)

(b) Design a Feedbck shift register encoder for a (8,5) cyclic code with generator Polynomial $g(x) = (1 + x + x^2 + x^3)$.
(i)Find the codeword for the msg 10101, by tracing the path through the encoder in systematic form.
(ii) draw the syndrome calucalator for the same and find the syndrome if the received codeword is 11011101 (5 +5)

Q.5 (a) With a neat diagram, explain how the Integrate and Dump Filter works as baseband Receiver. Draw the output waveform for a input of rectangular pulses. Derive the expression for its probability of error. (10)

(b) For a convolutional encoder with code rate 1/3 and constraint length 3 and generating Vectors g1= (1 1 1) , g2= (1 0 1) , g3= (1 1 0).
(i) draw the encoder and find the codeword for the input sequence 10101.
(ii) Sketch its state diagram and Trellis diagram (10)

Q.6 (a) Draw the signal constellation diagram for 16-PSK and determine its Euclidian distance . Compare it with that of 16-QASK .which of them has better noise immunity? (8)

(b) For the bit sequence, 10110101100 ,draw the MSK waveform (let m=5) (6)

(c) Explain with a neat diagram, Frequency hopping spread spectrum, FH-MFSK and explain Slow hopping and Fast hopping . how FH-SS is different from DS-SS ? (6)

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