Registration Number:

B.E. / B.Tech. (Full Time) DEGREE ARREAR EXAMINATION – APRIL/ MAY 2011
ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH
SIXTH SEMESTER – (REGULATIONS R 2004)
EC 382 – DIGITAL COMMUNICATIONS

Duration : 3 Hours Max. Marks = 100

Answer **ALL** the questions.

PART- A (10 x 2 = 20 marks)

1. Express mathematically the Nyquist's Criterion for pulse shaping to tackle Inter-Symbol Interference.
2. Discuss the features that can be observed from the eye-pattern of a received signal.
3. Draw the signal constellation and compare the Euclidean Distance for BPSK and BFSK signals having bit energy E_b and bit duration T_b.
4. Define bandwidth efficiency and power efficiency.
5. Obtain the entropy of two unbiased coins tossed together.
6. Given a bandwidth of 3.4 KHz and a SNR of 20 dB, calculate the capacity.
7. State and briefly explain Shannon's Channel Coding theorem.
8. Explain your understanding of free-distance in relation to Convolutional coding schemes.
9. Estimate the processing gain of a Direct Sequence Spread Spectrum System having a data rate of 9.6 Kbps and the channel bandwidth used being 1.25 MHz.
10. List out the properties of Pseudo-random sequences used in CDMA systems.

PART – B (5 x 16 = 80 marks)

11. Draw the block diagram of a direct sequence spread BPSK system and derive the processing gain and jamming margin for the same. Explain their significance.

12a. Explain the basis of operation of a matched filter receiver with suitable diagrams. Derive the condition for which the output signal–to-noise ratio is maximized.

'OR'

12b. Explain the necessity to go for Correlative Coding. Explain with suitable diagrams how the encoder and decoder are implemented in the Duo-binary and the Pre-coded Duo-binary schemes.

P.T.O.

13a. Explain the QPSK modulation scheme with suitable transmitter and receiver block diagrams. Also derive the average probability of error in the presence of AWGN using the signal space approach.

'OR'

13b. Highlight the difference between Binary orthogonal FSK and MSK modulation schemes. Draw their corresponding signal constellations and obtain an expression for the probability of bit error for both cases by estimating their minimum Euclidean distances from the signal constellation.

14a. A discrete memoryless source has an alphabet of seven symbols with probabilities for its output, as described below:

Symbol	S_0	S_1	S_2	S_3	S_4	S_5	S_6
Probability	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Obtain the Shannon-Fano code and the Huffman code for this source, moving a combined signal as high as possible. Compare the variance and efficiency of the two coding schemes.

'OR'

14b. Explain your understanding of Mutual Information and quantify it. List out the salient properties of Mutual Information. Obtain the Channel Capacity of a discrete memory-less binary symmetric channel by relating it to the Mutual Information.

15a. In a CRC error detecting scheme, $P(x) = x^4 + x + 1$. Draw the shift register circuit that will perform the encoding. Encode the bits (10010011011). Suppose the channel introduces an error pattern (100000000001000). What is the received bit pattern. Can the error be detected.

'OR'

15b. Consider a rate – ½, non-systematic Convolutional Code with $g^{(1)} = \{ 1, 0, 1 \}$ and $g^{(2)} = \{ 1, 1, 1 \}$. Draw the encoder structure and determine the encoder output corresponding to the data sequence { 1 1 1 0 1 0 1 }.

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