THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY, PATIALA
ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT
(EC-009, Communication Systems – II)
End Semester Examination
(B.E Final Year EC)

Instructor: Hardeep Singh — Dated:7/12/06

Max. Marks: 45 — Time: 3 Hours

Note: ***First five Attempted questions will be checked. Assume missing data if any.***

All questions carry equal marks.

Q1(a). Explain in detail the frequency hopping spread spectrum with suitable diagrams. (4.5)

(b). With the help of acquisition circuit for a FH signal, draw the necessary waveforms and explain them. (4.5)

Q2(a). Why flat-top sampling is required. Explain the flat-top sampling and spectrum of different signals. (4.5)

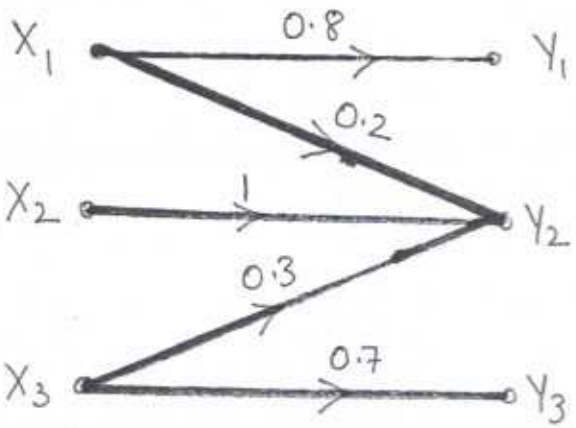
(b). Explain in detail the concept of differential pulse code modulation and delta modulation with suitable diagrams. (4.5)

Q3(a). What do you understand by matched filter? Explain in detail different properties of matched filter. (4.5)

(b). Explain companding in detail and also derive the relation of output signal to quantization noise. (4.5)

Q4(a). The generator polynomial of a (7,4) cyclic code is $g(x) = 1 + x + x^3$. Find the 16 codewords of this code. (4.5)

(b). A discrete source transmits messages x_1, x_2 and x_3 with the probabilities 0.3, 0.4 and 0.3. The source is connected to the channel given in figure below. Calculate all the entropies.



(4.5)

P.T.O

Q5(a). Apply the Huffman coding procedure for the following message ensemble:

[X] $[x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6 \quad x_7]$

[P] [0.4 0.2 0.12 0.08 0.08 0.08 0.04]

Take M = 2 and M = 3 to calculate the efficiency. (4.5)

(b). (i) Prove that a Dirac comb is its own Fourier transform

(ii) Find the exponential Fourier series of this Dirac comb and

(iii) Show that the result is similar to its Fourier transform. (4.5)

Q6(a). What do you understand by autocorrelation? Discuss with proof the properties of autocorrelation. (4.5)

(b). Explain in detail MSK with necessary waveforms and suitable diagrams. What is the difference between QPSK and MSK? (4.5)

Q7. A μ-law compander uses a compressor, which relates output to input by the relation.

$$y = \pm \frac{\log(1+\mu|x|)}{\log(1+\mu)}$$

Here the + sign applies when x is positive and the - sign applies when x is negative. Also $x \equiv V_i/V$ and $y \equiv V_o/V$ where V_i and V_o are the input and output voltages and the range of allowable voltage is $-V$ to $+V$. The parameter μ determines the degree of compression.

(i) A commonly used value is μ = 255. For this value make a plot of y versus x from x = -1 to x = +1.

(ii) If V = 40 volts and 256 quantization levels are employed what is the voltage interval between levels when there is no compression? For μ = 255 what is the minimum and what is the maximum effective separation between levels? (9)

Note: Students can see their evaluated sheets on date11/12/06 in the office of Hardeep Singh at time 12PM – 2PM.