6E 6054

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B.Tech. VI Semester (Main/ Back) Examination, May -June 2015

Electronics And Communication Engg.

6EC4A Digital Communication

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **Five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. any data you feel missing suitably be assumed and stated clearly.) Units of quantities used/ calculated must be stated clearly*

Assume erfc 2.23=2.54×10^{-3}, erfc 3.16= $.1\times10^{-5}$

Unit-I

1. a) When Quantization noise as well as channel noise are considered, derive an expression for the destination signal to noise ratio of a binary PCM system. **(8)**

   b) What is meant by slope over load distortion in a Delta modulation system? How it can be avoided? **(4)**

   c) Determine the out put SNR of a DM system for 1 KHz sinusoid sampled at 32KHz with out slope overload and followed by 4-KHz post reconstruction filter. **(4)**

(OR)

1. a) In a binary PCM system, the output signal to Quantization noise ratio is to be held to a 40dB determine the number of required levels, and find the corresponding output signal to Quantizing noise ratio. **(8)**

   b) With the help of block diagrams of the transmitter and receiver, explain the working of an ADM system with a discrete set of values for the step size. **(8)**

UNIT - II

2. a) What is "a raised cosine spectrum"? How does it help us to avoid ISI? **(4)**

b) Binary data is transmitted at the rate of 48 kbps using a baseband binary PAM system designed to have a raised cosine spectrum what is the transmission band width required if the roll off factor e=0.5 , 0.75? **(8)**

c) Consider the binary sequence 0100101. Draw the waveforms for the following formats

i) Unipolar NRZ

ii) Bipolar RZ

iii) AMI RZ

iv) Man Chester **(4)**

(OR)

2. a) Draw the block diagram of an optimum linear receiver for binary baseband signalling and explain its working. If a rectangular pulse is applied on matched filter find impulse response of matched filter. **(10)**

b) For an NRZ polar binary data the received signal is either +3V or -3V during a time slot The signal is corrupted by white noise of PSD $\eta = 10^{-4}\ Volt^2 / Hz$. If an receiver is used what should be the minimum duration of the time slot. If Pe is not to exceed to 10^{-5}? **(6)**

UNIT - III

3. a) What is QPSK? Write an expression for the signal set. Draw the signal - space diagram and show the signal constellation. Calculate the probability of error also. **(10)**

b) Given the input binary sequence 1100100010, sketch the modulated wave obtained by QPSK. **(6)**

(OR)

3. a) A binary band pass system transmits binary data at the rate of 2.5×10^6 bits/second. During the course of transmission, zero mean AWGN of 2 sided PSD equal to 10^{-14}W/Hz is added to the signal In the absence of noise, the amplitude of the received sinusoidal wave for digit '1' or '0' is 1 mv. Find the average probability of symbol error for the

   i) Coherent BFSK

   ii) Coherent BPSK **(8)**

   b) Draw the block diagrams of transmitter and receivers of MSK and explain working **(8)**

UNIT - IV

4. a) What is 'shannon limit' with reference to an AWGN power limited Guassian channel Define an ideal system. **(8)**

   b) An analog signal having 4 KHz B.W. is sampled at 0.25 times the Nyquist rate and each sample is Quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.

   i) What is the information rate of source?

   ii) Can the output of this source be transmitted without error over an AWGN channel with a band width of 10 KHz and an (S/N) ratio of 20 dB? **(8)**

(OR)

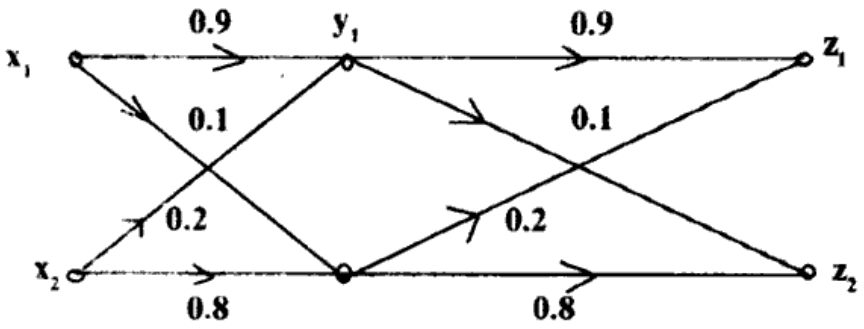
4. a) Explain mutual information & differential entropy **(3)**

   b) Verify the equations **(8)**

   i) $H(x,y) = H(x/y)+H(y)$

   ii) $I(x:y) = I(y:x)$

c) Two binary channels are connected in cascade find $P(z_1)$ and $P(z_2)$ when $P(x_1) = P(x_2) = 0.5$ **(5)**



UNIT - V

5. A "DMS" 'X' has five equally likely symbols $P(x_i)=0.2$ Construct a shannor Fanocode for 'X' and calculate the efficiency of the code. Repeat for Huffman code&compare result. **(16)**

(OR)

5. a) Let 'C' be a (7,4) cyclic code with $g(x) = 1+x+x^3$ Find a Generator matrix 'G' for C and find the code word for d = (1 0 1 0) **(10)**

b) Consider the convalutional encoder shown in figure and find the impulse response using the impulse response determine the output code word for input data d (1 0 1) **(6)**