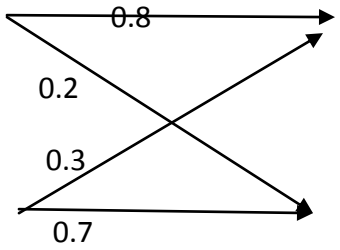
Department of ELECTRONICS & COMMUNICATION ENGG.

Numerical Question Bank

DIGITAL COMMUNIUCATION (EC-503) Semester: 5TH

INTRUCTIONS. 1. All questions with their solution are submitted till 27 October 2014.

Question-1 Find the mutual information and channel capacity of the channel shown in figure below. Given P(X1) = 0.6 and P(X2) = 0.4.



Question-2 A random variable has an exponential PDF given by f(x) = ae^$(-b|x|)$ where a and b are constant find (a) the relation between a and b. (b) the distribution function of x.

Question3- Apply Shannon Fano Coding Procedure to find coding efficiency for the following message ensemble. [Take M = 2]

[X] = [x1, x2, x3, x4, x5, x6, x7]

[P] = [0.4, 0.2, 0.12, 0.08, 0.08, 0.08, and 0.4]

Question-4 an urn contains 4 white and 3 black balls. Two balls are drawn successively with Denoting the number of black balls:

(a) Find the probability function of X.
(b) Draw the chart and histogram

Question-4 A fair die is tossed 5 times. A toss is called a success if face 1 or 6 appears, find:

1) The probability of 2 successes.
2) The mean and standard deviation for the number of successes.

Question-5 An signal is expressed by the equation x(t) = 3cos(50 πt) + 10sin(300 πt) – cos(100 πt). Calculate the nyquist rate for this signal.

Question-6 Find the nyquist rate and nyquist interval for the signal x(t)= 1/2 π cos(4000 πt) cos(1000 πt).

Question-7 A quaternary source generates information with probabilities P1 = 0.2, P2= 0.3, and P4= 0.4. Find the entropy of the system. What percentage of maximum possible information is being generation by this source?

Question-8 An event has six possible outcomes with the probabilities P1 = 1/2 , p2= 1/4 , p3= 1/8, P4= 1/16, P5= 1/32, P6= 1/32. Find the entropy of the system. Also the rate of information if there are 16 outcomes per second.

Question-9 A continuous signal is band limited to 5Khz. The signal is quantized in 8 levels of a PCM system with the probabilities 0.25, 0.2, 0.2, 0.1, 0.1, 0.05, 0.05 and 0.05. calculate the entropy and the rate of information.

Question-10 Two source are generating as given below.

Source-1 P1 = ¼, P2= 1/4 , P3= ¼, P4= ¼

Source-2 P1= ½, P2= ¼, P3= 1/8, P4= 1/8

The message rates are respectively 200 and 250 message per second. Compare H and R of sources.

Question-11 an urn contains 3 white and 4 black balls. Two balls are drawn successively with Denoting the number of white ball: Find the probability function of X.

Question-12 24 telephone channels, each band limited to 3.4 KHz, are to be time division multiplexed by using PCM. Calculate the bandwidth of PCM System for 128 quantization levels and an 8 KHz sampling frequency.

Question-13 A Container contains 3 white and 4 black balls. Two balls are drawn successively with Denoting the number of white ball: Find the discrete function for random variable X.

Question-14 Find the constant C so that the function

$$f(x)=\begin{cases} C(x-1), & 1<x<4 \\ 0 & otherwise \end{cases}$$

Question-15 For the PDF f(x)= Find $\begin{cases} \left(\frac{b}{a}\right)x+b, & x<0 \\ \left(-\frac{b}{a}\right)+b & x>0 \end{cases}$

(a) The relationship between a and b
(b) P(X>a/2)

Question-16 Apply Shannon Fano Coding Procedure to find coding efficiency for the following message ensemble. [Take M = 2]

[X] = [x1, x2, x3, x4, x5, x6, x7, x8]

[P] = [1/4, 1/8, 1/16, 1/16, 1/16, ¼, 1/16, 1/8]

Question17-Apply Haffman Coding Procedure to find coding efficiency for the following message ensemble. [Take M = 2]

[X] = [x1, x2, x3, x4, x5, x6, x7]

[P] = [0.4, 0.2, 0.12, 0.08, 0.08, 0.08, and 0.4]

Question18- The generate polynomial of a (7,4) cycle code is g(x) = 1+x+x^3. Find the 16 code words of this code.

Question-19 8 channels, each band limited to 2.5 KHz, are to be time division multiplexed by using PCM. Calculate the bandwidth of PCM System for 64 quantization levels and an 4 KHz sampling frequency.

Question-20 Show the relation between Mean, Variance and Standard Deviation.