Roll No ....

EC - 503

B.E. V Semester

Examination, December 2014

Digital Communication

Time : Three Hours

Maximum Marks : 70

Note: i)   Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii)   All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a)   Prove the following theorem on variance

$$\sigma^2 = E\left[(X-\mu)^2\right] = E(X^2) - \mu^2$$

b)   Establish a relationship between the moments about mean and origin.

c)   Write briefly about Gaussian probability density function.

d)   Write short note on correlation between Random variables.

OR

Discuss about the error probability as measured by finite samples.

Unit - II

2. a)   State and explain sampling theorem of low pass signals.

b)   Determine the channel bandwidth of PAM signal. Consider N number of base band signals, band limited to fm are being multiplexed.

c)   Explain flat topped sampling and also explain aperture effect associated with it. How can this be reduced?

d)   With the help of block diagram explain differential PCM. Also discuss need for a predictor.

OR

Discuss the working principle of Delta modulation. Justify why Delta modulation is not the practical alternative to PCM.

Unit - III

3. a)   Differentiate between ASK, PSK and FSK modulation techniques.

b)   How is BPSK signal generated. Justify why it is thought of as an AM signal.

c)   Discuss the generation and reception of differential DPSK system.

d) Explain the principle and generation of offset QPSK system.

OR

Explain the principle and generation of QASK system.

Unit - IV

4. a) How can pulse shaping reduce interchannel and intersymbol interference.

   b) Explain what is partial response signaling.

   c) Discuss about duobinary Encoding System.

   d) Discuss the principle working of optimum receiver.

OR

Determine the probability of error for the application of the coherent reception system in BPSK.

Unit - V

5. a) Derive the expression of average mutual information in terms of different entropic

   b) What is channel capacity? Determine the channel capacity of noise free channel.

   c) Discuss the bandwidth to S/N trade off of a Gaussian channel.

d) Apply the Shannon-Fano coding procedure for the following message ensemble.

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

$$[P] = [0.4, \quad 0.2, \quad 0.12, \quad 0.08, \quad 0.08, \quad 0.08, \quad 0.04]$$

Take $M = 2$. Also determine the code efficiency.

OR
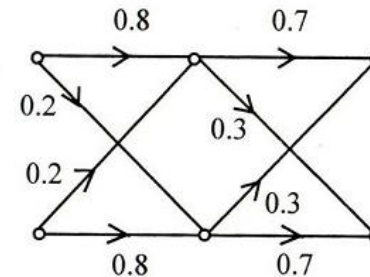
Find the channel capacity for the channel shown in fig. 1.

Fig - 1

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