State Shannon's theorem for channel capacity. A Gaussian channel has 1MHz bandwidth. If the signal to noise power spectral density $\frac{S}{N} = 10^5$ Hz. Calculate the channel capacity and maximum information rate.

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Roll No .....

EC-503

B.E. V Semester

Examination, June 2016

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 questions 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.

1. a) What do you understand by cumulative distribution function?

b) What is probability density function?

c) Define power spectral density.

d) The probability density function of amplitude x of a certain signal $x(t)$ is given by

$$p_x(x) = 0.5|x|e^{-|x|}$$

i) Find the probability that $x \geq 1$

ii) Find the probability that $-1 < x \leq 2$

OR

The probability density function of amplitude x of a certain signal $x(t)$ is given by

$$p_x(x) = 0.5|x|e^{-|x|}$$

Determine the mean, the mean square and the variance of the random variable x.

2. a) Write the advantages and disadvantages of delt modulation.

   b) Draw the waveforms for PAM, PPM, and PWM.

   c) A signal $x(t) = 3\cos(200t)\sin(350t)$ is to be sampled at the smallest allowable rate. What is the sampling rate?

   d) Explain the process of quantization. What is quantization error? Why companding is used in the process of quantization?

OR

Draw the transmitter and receiver block diagram of Delta modulation and explain it.

3. a) Explain binary PSK signal with geometrical representation.

   b) What are the advantages and disadvantages of differential phase shift keying?

   c) Draw the waveform for the binary data sequence 101100, FSK modulated.

   d) How coherent binary PSK signals are generated and detected? Also give the signal space diagram.

OR

Draw the block diagram of MSK transmitter and receiver and discuss in detail with required waveforms.

4. a) State Bayes theorem.

   b) Explain the concept of statistical independence.

   c) What is eye pattern?

   d) Draw the block diagram of a adaptive equalizer and explain it.

OR

Discuss Matched filter and derive the expression for figure of merit.

5. a) Define entropy.

   b) What is mutual information?

   c) Define information rate.

   d) Consider a source with 8 messages having probabilities 0.22, 0.20, 0.18, 0.15, 0.10, 0.08, 0.05 and 0.02 respectively. Find the codes for messages using Huffman algorithm. Also calculate the efficiency of the codes.

OR