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1599

M. Tech 1st Semester Examination

Information Theory and Random Signals

EC-105

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any five questions. All questions carry equal marks.

1. (a) Define probability distribution function. Explain different properties of PDF. **(10)**

   (b) Find the mean and variance of random variable 'x' defined by the PDF

$$f_x(x) = \frac{1}{b-a} \qquad a \le x \le b$$

$$= 0 \qquad \text{elsewhere}$$ **(10)**

2. (a) What do you mean by spectral density? Discuss the properties of power spectral density. **(10)**

   (b) The probabilities of the five possible outcomes of an experiment are

$$P_1 = \frac{1}{2}, P_2 = \frac{1}{4}, P_3 = \frac{1}{8}, P_4 = P_5 = \frac{1}{16}$$

   Find the entropy and information rate if there are 16 outcomes per second. **(10)**

3. (a) Calculate the capacity of AWGN channel with a band width of 1 MHz and S/N ratio of 40 dB. **(10)**

   (b) Explain Shannon Theorem in detail on coding for memoryless channel. **(10)**

4. A DMS 'x' has five equally likely symbols

   (a) Construct a Shannon-Fano code for x, and calculate the efficiency of the code.

   (b) Construct another Shannon Fano code and compare the results.

   (c) Construct the huffman code. **(20)**

5. (a) Write the encoder for convolutional codes. **(10)**

   (b) What are the properties of BCH codes? Discuss syndrome computers for these codes. **(10)**

6. (a) With the help of suitable example, explain the viterbi algorithm for decoding of convolutional code. **(15)**

   (b) What are the goals of cryptography? Discuss. **(5)**

7. (a) Discuss the maximum likelihood decoding for convolutional codes. **(10)**

   (b) Explain different error control strategies in communication system. **(10)**

8. Write short notes on :

   (a) Cyclic codes

   (b) Conditional probability **(10×2=20)**