

[Total No. of Questions - 8]  
(2123)

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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

$$f_x(x) = \frac{1}{b-a} \quad a \leq x \leq b$$
$$= 0 \quad \text{elsewhere} \quad (10)$$

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)

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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)
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