BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER : I**
BRANCH: ECE **SESSION : MO/19**

SUBJECT: EC512 STOCHASTIC PROCESSES AND INFORMATION THEORY

TIME: 3.00Hrs. **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) A binary source generates bits 0 and 1 in which the probability of generating a 0 is three times the probability of generating a 1. Output symbols are formed by taking two bits at a time. Find the PMF and sketch the CDF of output symbols. [5]

Q.1(b) Given the PDF $f_X(x) = e^{-x}, x \geq 0$ otherwise 0. Find the $\Phi_X(\omega)$, *E[X],* $E[X^2]$. [5]

Q.2(a) Define information and why logarithmic base is used to measure it. Explain differential entropy how one can define entropy for continuous random variable. [5]

Q.2(b) Explain the following terms: Entropy, Joint Entropy, Conditional entropy, Mutual information and Channel capacity. [5]

Q.3(a) Develop the statistical model of General information channel. How one can define the different kinds of information channels? [5]

Q.3(b) Describe Shannon-Fano technique of source encoding with source distribution 1/2, 1/4, 1/8, 1/16, 1/16. Also determine its average code word length and efficiency. [5]

Q.4(a) What is the rate distortions functions and its properties for Gaussian source? How one can express permissible single letter average distortion in terms of channel transition probabilities between the symbols transmitted and received. [5]

Q.4(b) What is the minimum signal-to-noise ratio that is needed to support 56K Modem over telephone channels? [5]

Q.5(a) Establish the information capacity for AWGN Gaussian channels. Comments over achievable rate region of Gaussian Multiple user channels and Gaussian Broadcast channel. [5]

Q.5(b) Write short notes on WSS and Source Coding. [5]

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