**Exam.Code:0928**
**Sub. Code: 6586**

**2014**

**B.E. (Electronics and Communication Engineering)**

**Fourth Semester**

**EC-407: Probability and Random Processes**

**Time allowed: 3 Hours** **Max. Marks: 50**

***NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.***

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|---|---|---|
| Q.1a) | Axiomatic approach of probability theory overcomes the limitations of classical approach. Discuss with suitable examples. | (2×5) |
| b) | What is the difference between mutually exclusive events and independent events? Illustrate with suitable examples. | |
| c) | Define central limit theorem. | |
| d) | Find the capacity of the Binary Symmetric Channel when probability p is given as 0.6. | |
| e) | Why flicker noise is called low frequency noise? | |
| | **Section A** | |
| Q.2a) | Define the term expectation. If X is a continuous random variable with pdf $f(x) = \begin{cases} \frac{2}{x^3} & ; x \geq 1 \\ 0 & ; x < 1 \end{cases}$ Find the Expectation of $x$. | (5) |
| b) | State and prove the Bayes Theorem. | (5) |
| Q.3 | What is Rayleigh Distribution? Find the probability that at most 5 defective fuses will be found in a box of 200 fuses, if experience show that 2 percent of such fuses are defective. | (10) |
| Q.4 | Enlist the properties of distribution function for continuous random variable. Let X be a continuous random variable with pdf $f(x) = \begin{cases} ax & ; 0 \leq x \leq 1 \\ a & ; 1 \leq x \leq 2 \\ -ax + 3a & ; 2 \leq x \leq 3 \\ 0 & ; otherwise \end{cases}$ a. Determine the constant a; b. P(X≤ 1.5) | (10) |
| | **Section B** | |
| Q.5a) | A signal is bandlimited to 8kHz. The signal is quantized in 6 levels of a system with respective probabilities as 0.2, 0.1, 0.1, 0.05, 0.05 and 0.05. Calculate the entropy and the rate of information. | (5) |
| b) | What is Johnson Noise? In a cascade amplifier, show that the contribution to overall noise-figure is primarily by the first stage and contribution by succeeding stages becomes smaller and smaller. | (5) |
| Q.6a) | "For a fixed signal power, and in the presence of white Gaussian Noise, the channel capacity approaches an upper limit with Bandwidth increased to infinity." Explain the related Trade-off. | (5) |
| b) | Verify that: H(XY)= H(Y/X) + H(X) where H represent the entropy and X, Y are transmitter and receiver respectively. | (5) |
| Q.7 | Apply the Huffman Coding to find the efficiency of the following message ensemble: [X] = [x1, x2, x3, x4, x5, x6, x7] [P] = [0.4, 0.2, 0.12, 0.08, 0.08, 0.08, 0.04] | (10) |

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