Code No: OR311151 **OR**

**III B.Tech I Semester Supplementary Examinations, April/May 2005**
**PROBABILITY & RANDOM VARIABLES**
**(Bio-Medical Engineering)**

**Time: 3 hours** **Max Marks: 70**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Give the classical and axiomatic definitions of Probability.
   (b) If a three digit decimal number is chosen at random, find the probability that exactly K digits are greater than equal to 5, for $0 \leq K \leq 3$ .
   (c) Three boxes of identical appearance contain two coins each. In one box both are gold; in the second both are silver and in the third box one is silver and the other is the gold coin. Suppose that a box is selected at random and further that a coin in that box is selected at random. If this coin proves to be gold, what is the probability that the other coin is also gold?

2. (a) Explain the Gaussian distribution with a neat sketches of pdF and cdF.
   (b) An analog signal received at the detector (measured in microvolts) may be modeled as a Gaussian random variable N (200,256) at a fixed point in time. What is the probability that the signal will exceed 240 $\mu$vs. what is the probability that the signal is larger than 240 $\mu$V, given that it is larger than 210 $\mu$Vs?

3. (a) State and prove any four properties of mean of a random variable X.
   (b) Prove that the density function of sum of two statistically independent random variables is the convolution of their individual density functions.

4. Find the Auto correlation function and power spectral density of the Random process.
   x(t) = K Cos $(\omega_o t + \theta)$ Where $\theta$ is a Random variable over the ensemble and is uniformly distributed over the Range ( 0, $2\pi$)

5. Find the input auto correlation function, output autocorrelation and o/p spectral density of RC low pass filter, where the filter is subjected to a white noise of spectral density $N_0/2$.

6. Give reasons for the following:
   (a) In any communication system the first stage must have low noise operation.
   (b) Describe how FET gives low noise performance compared to BJT.

7. (a) The noise figure of an amplifier at room temperature (T=290°K) is 0.2db. Find the equivalent temperature.
   (b) Explain the concept of effective input noise temperature.

8. Explain the following:
   (a) Code efficiency
   (b) Noiseless-coding theorem
   (c) Ideal channel
   (d) Hamming codes.

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