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C – 2631

Reg. No. : ....

Name : ....

First Semester M.Tech. Degree Examination, June 2017
(2013 Scheme)
Branch : ELECTRONICS & COMMUNICATION
TSC 1001 : Random Processes and Applications

Time : 3 Hours Max. Marks : 60

Instruction : *Answer **two** questions from **each** Module.*

Module – 1

1. a) State and prove Bayes' Theorem in Probability. **5**

   b) A box contains 5 balls. Two balls are drawn at random and are found to be while. What is the probability of all the balls being white ? **5**

2. a) Define CDF and pdf of a random variable X and list their properties. **4**

   b) Two jointly continuous random variable X and Y have the joint pdf.

$$f_{xy}(x,y) = \begin{cases} A(x+y), & 0 < x \le 1,\ 0 < y \le 1 \\ 0 & \text{otherwise} \end{cases}$$

   Find the value of A and then evaluate .

   i) $f_X(x)$ ii) $P[X + Y \le 1]$. **6**

3. If X is a Gaussian random variable with zero mean and variance σ^2. Find the probability density function of the random variable $Y = X^2$. **10**

Module – 2

4. a) Define Moment generating function of a random variable X. **3**

   b) X and Y are two i.i.d random variables with pdfs, $f_x(x) = f_Y(x) = \frac{1}{a}\text{rect}\left(\frac{x}{a}\right)$.

   Compute the pdf of Z = X + Y using characteristics functions. **7**

P.T.O.

5. Define the following :
   i) Poisson Counting Process.
   ii) Wiener Process. **10**

6. a) Define a WSS random process and give an example. **4**

   b) A white Gaussian noise process with two sided power spectral density $\frac{N_0}{2}$ is given as input to an ideal low pass filter with cut off frequency B Hz and gain unity. Find the Power Spectral Density and Auto-correlation of the output random process. **6**

Module – 3

7. State and prove Central Limit Theorem. **10**

8. a) Define almost sure convergence and convergence in probability of a sequence of random variables. **4**

   b) State and prove Weak Law of large numbers. **6**

9. Obtain K-L expansion of a Wiener random process. **10**
