



Reg. No. :

Name :

**First Semester M.Tech. Degree Examination, March 2015
(2008 Scheme)**

Branch : Electronics and Communication Engineering

Stream : Telecommunication Engineering

**TTC 1004 : PROBABILITY AND RANDOM PROCESS FOR
COMMUNICATION**

Time : 3 Hours

Max. Marks : 100

Instructions : i) Answer **any five** questions.
ii) **All** questions carry **equal** marks.

1. a) Show that the real random process $\{X_t, 0 \leq t < \infty\}$, where $E(X_t) = 0$, for all $t \geq 0$ and $E(X_t X_s) = \min(t, s)$ for all $t, s \geq 0$ has orthogonal increments, where $\min(\bullet)$ denotes minimum of (\bullet) . 12
- b) Show that the difference of two independent Poisson processes is not a Poisson process. 8
2. a) Derive the necessary and sufficient condition for a wide-sense stationary random process $X(t)$ to be ergodic in mean. 14
- b) State and prove any two properties of autocorrelation function. 6
3. a) Derive the relationship between power spectral density at the input and output of an linear time invariant system with impulse response $h(t)$. 10
- b) If the input of a linear time invariance system is a Gaussian process, prove that the output is also a Gaussian process. 10
4. a) State and prove weak law of large numbers. 14
- b) Define Chi-square distribution and explain its properties. 6





5. a) Let X_1, X_2, \dots denote an i.i.d. sequence of Gaussian random variables each with mean 75 and variance 225. How many samples are required to guarantee that the sample mean is between 74 and 76 with probability 0.99. **14**
- b) Explain how do you find the distance between the signals $x(t)$ and $y(t)$ belonging to a certain signal space. **6**
6. a) Derive Yule-Walker equations for ARMA process. **12**
- b) Explain what is meant by innovation processes and whitening filter. **8**
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