(Pages : 2) **B – 2827**

Reg. No. : ....

Name : ....

First Semester M.Tech. Degree Examination, December 2016
(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) Prove that the Poisson process is a Markov process. **10**

   b) Let X(t) be a Brownian motion process with variance αt. For a constant c > 0, determine whether Y(t) = X(ct) is a Brownian motion process. **10**

2. a) Let $X_t(\omega) = \cos(t + \theta(\omega))$, where θ is a r.v. uniformly distributed in $[-\pi, \pi]$. Is X_t ergodic in mean sense ? Justify your answer. **10**

   b) A random process X(t) with autocorrelation $R_x(t_1, t_2)$ has a mean square derivative at time t if $\frac{\partial^2 R_x(t_1, t_2)}{\partial t_1 \partial t_2}$ exists at $t_1 = t_2 = t$. **10**

3. a) Show that every quadratic mean continuous wide sense stationary process with an absolutely integrable autocorrelation function $R(\tau)$ possesses a power spectral density $S_x(\Omega)$, that is, a nonnegative integrable function satisfying the relation **15**

$$R(\tau) = \int_{-\infty}^{\infty} S_x(\Omega) e^{i2\pi\Omega\tau} d\Omega$$

   b) What is meant by white processes ? Explain. **5**

P.T.O.

4. Let X_1, X_2, ... be an independent identically distributed (i.i.d.) sequences of nonnegative random variables with finite mean μ. Show that $n^{-1}\sum_{k=1}^{n} X_k$ converges to μ almost surely as $n \to \infty$. **20**

5. a) Define Rician distribution and explain its properties. **6**

   b) State and prove central limit theorem. **14**

6. a) Explain spectral estimation of a wide sense stationary random process using AR model. **14**

   b) State the spectral decomposition theorem for a w.s.s. process and explain. **6**
