



Code No. : 5277/O

**FACULTY OF INFORMATICS**  
**B.E. 2/4 (IT) II Semester (Old) Examination, May/June 2012**  
**PROBABILITY AND RANDOM PROCESS**

Time : 3 Hours]

[Max. Marks : 75

**Note : Answer all questions from Part A, Answer any five questions from Part B.**

**PART – A**

**(25 Marks)**

1. State the Addition Theorem for 3 events. 2
2. A player tosses five coins at a time. Find the probability that the head appearing even times. 3
3. Find moment generating function of p.m.f.  $P(x) = \frac{e^{-\lambda} \cdot \lambda^x}{x!}$   $\lambda > 0$ .  $x \geq 0$  2
4. Define Random vector and give one example. 2
5. Find variance of the p.d.f.  $f(x) = \theta e^{-\theta x}$   $\theta > 0$ .  $x \geq 0$  3
6. If X and Y are independent random variables show that  $V(X - Y) = V(X) + V(Y)$ . 2
7. State the properties of Auto Correlation function. 3
8. Define a stationary process and briefly explain ergodicity. 3
9. Define Gaussian process. 2
10. Explain briefly about a low pass filter. 3

**PART – B**

**(50 Marks)**

11. a) State and prove Baye's Theorem. 5  
b) In a coin experiment, if a coin shows head, 1 dice is thrown and result is recorded, and if the coin shows tail, 2 dice are thrown and sum is recorded. Find the probability recorded number will be 2. 5

12. a) If  $X$  has an exponential distribution with parameter 1 find the pdf of  $Y = \sqrt{X}$ . 5
- b) Find mean, variance of the r.v for p.d.f.  $f(x) = \frac{1}{\Gamma(n)} e^{-ax} x^{n-1} a^n$   $n > 0; a > 0; x \geq 0$ . 5
13. a) State the properties of power spectral density function. 4
- b) The auto correlation function of the random telegraph signal process is given by  $R(T) = a^2 e^{-2\alpha|T|}$ . Find the power density function of the random signal. 6
14. If  $U(t) = X \cos t + Y \sin t$  and  $V(t) = Y \cos t + X \sin t$  where  $X$  and  $Y$  are independent r.v's such that  $E(X) = 0 = E(Y)$ ;  $E(X^2) = E(Y^2) = 1$  show that  $U(t)$  and  $V(t)$  are individually stationary in the wide sense (WSS) but they are not jointly W.S.S. 10
15. a) The random binary transmission process  $X(t)$  is a WSS process with zero mean and auto correlation function  $R(T) = 1 - \frac{|T|}{T}$ . Find Mean and Variance of time average of  $X(t)$  over  $(0, T)$ . 6
- b) State the properties of cross correlation function. 4
16. The joint random variables  $(X, Y)$  probability function is given by  $f(x, y) = K(x^3y + xy^3)$   $0 < x < 2; 0 < y < 2$  find  
i)  $K$       ii)  $f(x)$ ,  $f(y)$       iii)  $\text{cov}(x, y)$       iv)  $f(x/y)$  10
17.  $X(t)$  is the input voltage to a circuit and  $Y(t)$  is the output.  $\{X(t)\}$  is a stationary random process with  $E(X) = 0$ ;  $R_{XX}(T) = e^{-\alpha|T|}$   
transfer function :  $H(W) = \frac{R}{R + iLW}$   
find  $R_{YY}(T)$ . 10