Code No. : **6248**

FACULTY OF INFORMATICS

B.E. 2/4 (IT) II Semester (Supple.) Examination, Dec. 2009

PROBABILITY AND RANDOM PROCESSES

Time: 3 Hours] [Max. Marks: 75

Instruction : *Answer **all** questions of Part **A**.*
*Answer **five** questions from Part **B**.*

PART – A **(25 Marks)**

1. State the axioms of probability function. **(10×2.5 Marks)**

2. Two dice are rolled find the probability, mean and variance for sum '8'.

3. State the properties of probability density function.

4. State and prove addition theorem for the expectation of two random variables.

5. Four persons were attended the interview, the probability of answering each person is 1/6 independently. Find the probability at least one of them answers correctly.

6. State the properties of characteristic function.

7. Define noise, and give its types.

8. Snow that two independent Poisson process is also a Poisson process.

9. State the Wiener-Kichnen's relation.

10. Explain about the Markov process.

PART – B **(50 Marks)**

11. a) State and prove Baye's theorem. 5

b) A speaks truth 4 out of 5 times, A coin is tossed, he reports that there is a 'head', what is the probability that there was a head ? 5

12. a) Derive mean and variance of gamma random variable in two parameters. 5

b) If 'x' is continuous random variable $f(x)=\begin{cases}\frac{1}{K}e^{-x^2/2} & -\infty < x < +\infty \\ 0 & \text{otherwise}\end{cases}$ 5

Find :

a) K

b) Variance.

13. a) Explain the properties of auto co-variance. 5

b) Show that the process X (t) = A cos λ t + B sin λ t (where A and B are r.v's) is wide sense stationary if 5

i) E (A) = E (B) = 0 ;

ii) E (A^2) = E (B^2)

iii) E (AB) = 0.

14. a) Two random processes X (t) and Y (t) are defined by X (t) = A cos ω_0 t + B sin ω_0 t and Y (t) = B cos ω_0 t – A sin ω_0 t. Show that X (t) and Y (t) are jointly wide - sense stationary if A and B are uncorrelated r.v's with zero means and the same variance and ω_0 is a constant. 5

b) Consider the random process V(t) = cos (ω t + θ) ; where 'θ' is a r.v. with p.d.f 5

$$f(\theta)=\begin{cases}\frac{1}{2\pi} & -\pi < \theta < \pi \\ 0 & \text{elsewhere}\end{cases}$$

show that the first and second moments of V(t) are independent of time.

15. Let X and Y be r.v's with j.d.f. **10**

$$f(x,y)=\begin{cases}4\,xy & 0<x<1\,;\,0\le Y\le 1\\ 0 & \text{otherwise}\end{cases}$$

Find :

i) V (X)

ii) V (Y)

iii) COV (X, Y)

16. Consider a White Gaussian noise mean and power spectral density No/2 applied to low pass RC filter whose function $H(f)=\dfrac{1}{1+2\pi\, i\, f\, RC}$. **10**

Find the auto correlation function of output random process.

17. Explain the terms :

a) Poisson process. **3**

b) Filters. **4**

c) Ergodic process. **3**
