Code No. 5277 / O

FACULTY OF INFORMATICS

B.E. 2/4 (IT) II – Semester (Old) Examination, December 2012

Subject : 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 and prove addition theorem of probability for 3 events. (3)
2. State multiplication theorem for 'n' events. (2)
3. Define probability space. (2)
4. Find mean and variance of Bernoulli's distribution. (3)
5. State properties of probability density function. (2)
6. Define discrete random variable and give an example. (2)
7. State any three properties of cross co-variance. (3)
8. Define Gaussian process. (2)
9. Define Low-Pass and Band-pass noise. (3)
10. State Weiner-Kinchine theorem. (3)

PART – B (50 Marks)

11.a) State and prove Baye's Theorem. (5)

b) For a certain binary communication channel, the probability that a transmitted '0' is received as a '0' is 0.95 and the probability that a transmitted '1' is received as '1' is 0.90. If the probability that a '0' is transmitted is 0.4, find the probability that? (5)

i) a '1' is received and
ii) a '1' was transmitted given that a '1' was received.

12. Let X_1 and X_2 be two RV's with joint pdf given by (10)

$$f(x_1, x_2) = e^{-(x_1+x_2)} \; ; \; 0 \le x_1, x_2 < \infty$$
$$= 0 \quad ; \quad \text{otherwise.}$$

i) Find the Marginal density of X_1 and X_2.
ii) Are X_1, X_2 independent
iii) Also find $P(X_1 \le 1, X_2 \le 1)$ and $P(X_1 + X_2 \le 1)$.

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13.a) If the continuous RV X has pdf $f_x(x) = \frac{9}{2}(x+1),$ in -1< x < 2 and = 0, elsewhere, Find the pdf of Y = X^2. (5)

b) The following table represents the joint probability distribution of discrete RV(X, Y). Find all the marginal and conditional distribution. (5)

Y	**X**		
	1	**2**	3
1	1/12	1/6	0
2	0	1/9	1/5
3	1/18	1/4	2/5

14.a) Show that the random process X(t) = A cos ($\omega_0 t + \theta$) is wide – sense stationery if A and ω_0 are constants and θ is a uniformly distributed RV in (0, 2π). (5)

b) If {X(t)} is a wide-sense stationery process with autocorrelation $R(\tau) = Ae^{-a|\tau|,}$ (5) determine the second order moment of the RV (X(8)-X(5)).

15. It is given that $R_x(\tau) = e^{-|\tau|}$ for a certain stationery Gaussian random process {X(t)}. Find the joint pdf of the RVs X(t), X(t -1) X(t +2). (10)

16. Let X and Y be r.vs with jdf. (10)

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

Find

i) V(X)
ii) V(Y)
iii) COV (x, y)

17. Consider a white Gaussian noise of zero mean and power spectral density No/2 applied to a low-pass RC filter whose transfer function is $H(f) = \frac{1}{1 + i2\pi RC}$. Find the auto correlation function of the output random process. (10)

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