Code No. 5435 / N

FACULTY OF INFORMATICS

B.E. 2/4 (I.T.) II – Semester (New) (Main) Examination, May / June 2016

Subject: Probability & Random Processes

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 If *A, B* and *C* are any three events such that $P(A) = P(B) = P(C) = \frac{1}{4}$, $P(A \cap B) = P(B \cap C) = 0$ and $P(A \cap C) = \frac{1}{8}$.
Find the probability that atleast one of the events *A, B, C* occurs. 3

2 State the generalised form of Bernoulli's theorem on independent trials. 2

3 For a random variable X the probability distribution is given by $P(x) = {}^{k}/_{2^x}$ for $x = 0,1,2,3,4$. Find the mean and variance of X. 3

4 A random variable $\mathbf{X}$ takes the values 1 and 0 with probabilities p and $(1-p)$ respectively. Find the variance of $\mathbf{X}$. 2

5 State the properties of characteristic function. 2

6 Write the probability function of two dimensional random variable (X,Y) 3

7 If X and Y are independent random variables then show that $E\left(\frac{Y}{X}\right) = E(Y)$ 2

8 Define stationary process. What are the necessary and sufficient conditions for a process to be stationary? 3

9 State Weiner-Khinchine theorem. 2

10 Define Guassian process. State its properties. 3

PART – B (5x10 = 50 Marks)

11 a) State and prove Baye's theorem. 3

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 (i) a 1 is received (ii) a 1 was transmitted given that a 1 was received. 7

12 a) Define cumulative distribution function of a random variable. State its properties. 4

b) A random variable X has the following probability distribution 6

x	*-2*	*-1*	*0*	*1*	*2*	*3*
P(x)	*0.1*	*k*	*0.2*	*2k*	*0.3*	*3k*

i) Evaluate $P(X < 2)$ and $P(-2 < X < 2)$ (ii) find c.d.f. of X (iii) evaluate $E(X)$

…2.

13 For the joint probability distribution of two random variables X and Y given below 10

$X \setminus Y$	1	2	3	4
1	4/36	3/36	2/36	1/36
2	1/36	3/36	3/36	2/36
3	5/36	1/36	1/36	1/36
4	1/36	2/36	1/36	5/36

Find

i) Marginal distributions of X and Y

ii) Conditional distribution of X given the value of $Y = 1$

iii) Conditional distribution of Y given the value of $X = 2$

14 a) Define auto-correlation and state its properties. 5

b) Define power spectral density function. State its properties. 5

15 a) Find the mean and auto-correlation of Poisson process. 4

b) Suppose that customers arrive at a bank according to a Poisson process with mean rate of 3 per minute. Find the probability that during a time interval of 2 minutes i) exactly 4 customers arrive (ii) more than 4 customers arrive. 6

16 a) The joint p.d.f. of r.v. (X, Y) is given by $f(x, y) = k\,x\,y e^{-(x^2+y^2)}\ x > 0, \quad y > 0.$ Find the value of k and prove that X and Y are independent. 5

b) 15% of the employees of a firm are B.E. degree holders, 25% are M.B.A. degree holders and 5% have both the degrees. Find the probability of selecting a B.E. degree holder, if the selection is confined to M.B.A. degree holder. 5

17 a) For a distribution mean is 10, variance is 16, $\gamma_1 = 1$ and $\beta_2 = 4$. Obtain the first four moments about origin. 5

b) Show that spectral density and the autocorrelation function of a real SSS process form a Fourier Cosine transform pair. 5

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