LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **MATHS & PHYSICS**

FOURTH SEMESTER – **APRIL 2012**

# ST 4206/4201 - MATHEMATICAL STATISTICS

 Date : 19-04-2012 Dept. No. Max. : 100 Marks

 Time : 1:00 - 4:00

**SECTION A**

**Answer all the questions. 10 X 2 = 20**

1. Define random experiment.
2. What are independent events?
3. If Var(X) = 4, find Var(3X + 8).
4. Define continuous uniform distribution and write its mean and variance.
5. State any two applications of t-test.
6. Write down the mean and variance of Binomial distribution.
7. Define exponential distribution.
8. Write any two properties of regression coefficients.
9. What is null hypothesis?
10. Define critical region.

**SECTION B**

**Answer any five questions. 5 X 8 = 40**

1. An urn contains 6 white, 4 red and 9 black balls. If 3 balls are drawn at random, find the probability that
2. Two of the balls drawn are white.
3. One ball of each colour is drawn.
4. None is red.
5. At least one is white
6. If p1 =P(A), p2 =P(B) and p3 =P(A∩B), (p1, p2,p3 >0); express the following in terms of p1, p2 and p3. $P\overbar{(A∪B)}$ , P(A/B), $P(A∩\overbar{B})$ and $P(\overbar{A}∩B)$
7. A random variable X has the following probability function:

x : 0 1 2 3 4 5 6 7

p(x) : 0 k 2k 2k 3k k2 2k2 7k2 + k

Find k, evaluate P(X<6).

1. State any four properties of Distribution function.
2. Find mean and variance of Poisson distribution.
3. Derive the rth order moments of Rectangular distribution and hence find standard deviation.
4. Obtain the line of regression of Y on X for the following data:

X: 65 66 67 67 68 69 70 72

Y: 67 68 65 68 72 72 69 71

1. What are the steps involved in solving testing of hypothesis problem?

(PTO)

**SECTION C**

**Answer any two questions. 2 X 20 = 40**

1. a) State and prove addition theorem of probability.

b) Sixty percent of the employees of XYZ Corporation are college graduates. Of these, ten are in sales. What is the probability that

1. An employee selected at random is in sales?
2. An employee selected at random is neither in sales nor a college graduate? (10+5+5)
3. The joint probability density function of a two-dimensional random variable (X,Y) is given by:

$$f\left(x,y\right)=\left\{\begin{matrix}2,;0<x<1, 0<y<x;\\0, elsewhere \end{matrix}\right.$$

1. Verify that whether f(x,y) is a joint p.d.f.
2. Find the marginal density functions of X and of Y
3. Find the conditional density function of Y given X=x and conditional density function of X given Y=y.
4. Check for independence of X and Y. (5+6+6+3)
5. a) A manufacturer, who produces medicine bottles, finds that 0.1 % of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contain:
6. no defective.
7. atleast two defectives. (5+5)
8. Derive mean and variance of Beta distribution of first kind. (10)
9. Derive the p.d.f. of the F-statistic with (n1, n2) degrees of freedom. (20)

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