Exam.Code:0002
Sub. Code: 0143

2071

B.A./B.Sc. (General) Second Semester

Statistics

Paper - 103: Probability Theory and Descriptive Statistics –II

Time allowed: 3 Hours Max. Marks: 65

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Simple non-programmable calculator is allowed. Statistical tables and log tables will be provided on request.*

x-x-x

1. Answer the following:

(i) Give any two applications of Geometric distribution.

(ii) State the mean of Beta distribution of II kind and the condition for it to exist.

(iii) State any three properties of Normal distribution.

(iv) Define covariance between two random variables X and Y. What happens to the covariance when they are independent?

(v) If the correlation between X and Y is 0.5, what is correlation between 5X and -3Y?

(vi) State weak law of large numbers. (2,2,3,2,2,2)

UNIT-I

2. (a) Derive the mean and variance of Gamma distribution.

(b) If a random variable X is a Poisson variable with P (X =1) = P (X = 2), find the variance of X.

(c) Show that Binomial distribution tends to Poisson distribution under some conditions. (6,3,4)

3. (a) Derive the recurrence relation for the moments of Poisson distribution and explain its usefulness.

(b) A random X has the following probability density function (pdf):

f(x) = 1 / 10, -5 < x < 5 and f(x) = 0, otherwise. Find (i) $P(|X-1|<3)$ and (ii) variance of X. Also find value of the constant 'k' for which $(X > k) = 2/5$. (6,7)

4. (a) Let X and Y follow Bivariate Normal distribution with μ_1=3=E(X), μ_2=1=E(Y), σ_1^2 =16=Var(X), σ_2^2 =25=Var(Y) and ρ = 3/5=Corr(X,Y). State the conditional distribution of X given Y = 4 and its parameters.

(b) If X is binomially distributed with parameters n and p, find the distribution of Y=(n-X)?

(c) State the pdf of Exponential distribution and find its variance. (3,4,6)

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5. (a). State Lindeberg-Levy central limit theorem and provide any of its two applications.

   (b) For a Binomial distribution with parameters (12,0.2), find $P[|X - E(X)| \geq 3Var(X)]$ and compare the result obtained by Chebyshev's inequality. (6,7)

UNIT-II

6. Consider the following bivariate data:

X:	3.31	2.41	2.11	3.01	2.13	2.41	2.10	2.41	2.09	3.00
Y:	4.09	3.84	2.97	3.22	3.96	2.76	3.42	3.38	3.28	2.93.

   (a) Find two regression equations describing the relationship between the two variables.

   (b) Compute coefficient of determination and give your interpretation.

   (c) Estimate X when Y = 2.00 and Y when X = 2.80. (8,3,2)

7. (a) Explain the use of partial and multiple correlation coefficients.

   (b) For a trivariate data set: $r_{12} = 0.60, r_{13} = -0.42$ and $r_{13} = -0.80$. Determine the multiple correlation coefficient $R_{1.23}$ and the partial correlation coefficient $r_{13.2}$ and interpret your results.

   (c) State the merits and demerits of rank correlation. (4,6,3)

8. (a) Explain the concept of consistency and independence of attributes. Also illustrate them with an example.

   (b) Calculate the coefficient of colligation from the following data:

$$(AB) = 35, (A\beta) = 15, (\alpha B) = 10, (\alpha\beta) = 15.$$

   Also verify the relation between coefficient of association and coefficient of colligation for the given data. (8,5)

9. (a) For a bivariate data you are given that the variance of X is 9. The regression equations are 8X-10Y+66 = 0 and 40X-18Y-214=0. Find (i) average values of X and Y, (ii) correlation coefficient between two variables and (iii) standard deviation of Y.

   (b) Write down the properties of regression coefficients. (9,4)

x-x-x