2072
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 <u>five</u> 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

Q.1

(i) State any three properties of Normal distribution.
(ii) Define covariance between two random variables X and Y. What happens to the covariance when they are independent?
(iii) Write down the expression for Karl Pearson's Correlation Coefficient.
(iv) Write down the properties of regression coefficients.
(v) State weak law of large numbers.
(vi) Define discrete uniform distribution along with its example.

(3, 2, 2, 2, 2, 2)

Unit-1

Q.2

(a) The amount of bread (in hundred of pound) x that a certain bakery is able to sell in a day is found to be a numerical valued random phenomenon, with a probability function specified by the pdf f(x), given by

$$f(x) = \begin{cases} kx & for \ 0 \leq x < 5 \\ k(10-x) & for \ 5 \leq x < 10 \\ 0 & otherwise \end{cases}$$

(i) Find the value of k such that f(x) is a probability density function
(ii) Evaluate $P[X > 5]$, $P[X < 5]$, $P[2.5 \leq X \leq 7.5]$

(b) Derive the mean and variance of Geometric distribution.

(7, 6)

Q.3

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

(7, 6)

Q.4

(a) Define Uniform Distribution. Find its mean, variance and moment generating function.
(b) Define Exponential distribution. Write down the properties of Exponential distribution. Also define memory less property of Exponential distribution.

(7, 6)

Q.5

(a) State Lindeberg-Levy central limit theorem and provide any of its two applications.
(b) Show that Binomial distribution tends to Poisson distribution under some conditions.

(7, 6)

Sub. Code: 0143

(2)

Unit-2

Q. 6 The data given below shows the expenditure on advertising and sales:-

Advertising expenses ('000 Rs.): x	39	65	62	90	82	75	25	98	36	78
Sales (lakh Rs.): y	47	53	58	86	62	68	60	91	51	84

(i) Find the regression equation of sales on advertisement expenses.

(ii) Calculate the sales when an advertisement expense is 25.

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

(7, 2, 4)

Q.7

(a) For 50 students of a class, the regression equation of marks in Statistics (X) on the marks in Accountancy (Y) is $3Y-5X+180 = 0$. The mean marks in Accountancy is 44 and variance of marks in Statistics is $9/16^{th}$ of the variance of marks in Accountancy. Find the mean marks in Statistics and the coefficient of correlation between marks in two subjects.

(b) Define Correlation. Give detailed note on various type of correlation with examples. Also define scatter plot. Describe in detail how it is used to study relationship between two variables.

(7, 6)

Q.8

(a) Write a detailed note on Spearman's Rank Correlation Coefficient, clearly mentioning its formula and its important properties.

(b) Define and explain the use of partial and multiple correlation coefficients.

(7, 6)

Q.9

(a) Write down the conditions and various relationships between class frequencies for consistency

of data in case of three attributes.

Also examine the consistency of following data:

N= 1,000, (A) = 600, (B) = 500, (AB) = 50, the symbols having their usual meaning.

(b) What do you mean by independence of attributes? Give a criterion of independence for attributes A and B.

(7, 6)

x-x-x