2053
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

Q.1

(i) Show that linear function of Normal distributed random variables is again normally distributed.
(ii) Why is Chebyshev's inequality used?
(iii) Write down the expression for Spearman's rank Correlation Coefficient.
(iv) Show Scatter diagram showing no correlation.
(v) State weak law of large numbers.
(vi) Define beta distribution of first kind along with its applications.

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

Unit-1

Q.2

(a) The diameter of an electric cable, say X, is assumed to be a continuous random variable with PDF

$$f(x) = 6x(1-x), \quad 0 \le x \le 1$$

(i) Check that $f(x)$ is pdf
(ii) Find the cdf of X
(iii) Determine a number b such that $P[X < b] = P[X > b]$.

(b) Define Gamma Distribution. Find its mean and variance.

Q.3

(7, 6)

(a) Let X be a Poisson r.v. with parameter λ. Find a bound for the probability that X deviates from λ by more than $2\sqrt{\lambda}$.

(b) Define Exponential distribution. Write down the properties of Exponential distribution. Also define memory less property of Exponential distribution.

(7, 6)

P.T.O.

Q.4

(a) State and prove Chebyshev's inequality.
(b) Define Poisson distribution. Compute moment generating function of Poisson distribution and hence find mean and variance of Poisson distribution. Also write down the procedure of fitting Poisson distribution.

Q.5

(7, 6)

(a) State and prove Lindberg Levy Central Limit Theorem.
(b) Define weak law of large numbers (WLLN). Check whether WLLN holds for the sequence $\{X_n\}$ where

$$P(X_n = \pm n) = \frac{1}{2\sqrt{n}} \text{ and } P(X_n = 0) = 1 - \frac{1}{\sqrt{n}}.$$

(7, 6)

Unit-2

Q. 6

In the study of the relationship between Age and weight of the children, the following data were collected.

Age (years): x	1	2	3	4	5
Weight (Kg.): y	3	4	6	7	12

For this data
  (a) Draw scatter diagram and give your comments
  (b) Compute product moment correlation coefficient

Q.7

(5,8)

(a) The regression equation of profit (X) on sales (Y) of a certain firm is $3Y-5X+108 = 0$. The average sales of a firm were Rs. 44,000 and variance of profits is 9/16 of the variance of sales. Find out average profits and coefficient of correlation between sale and profits.
(b) What do you understand by the term 'Regression'? Define the regression equation of Y on X and its usefulness.

Q.8

(7, 6)

(a) Give two measures of association for between attributes. List down their important properties. Using an example describe how is their values are interpreted.
(b) Define and explain the use of partial and multiple correlation coefficients.

(7, 6)

Q.9

(a) What are attributes? How is the relationship between two attributes studied?
(b) What do you mean by independence of attributes? Give a criterion of independence for attributes A and B.

(7, 6)

x-x-x