Exam.Code: 0001
Sub. Code: 0041

1126

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

Statistics

Paper - 101: Probability Theory and Descriptive Statistics – I

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.*

x-x-x

1. (i) Define a random experiment and sample space.

   (ii) State multiplication theorem of probability.

   (iii) Show that if A and B are two independent events then A and B^c are also independent.

   (iv) Differentiate between primary data and secondary data.

   (v) Distinguish between discrete and continuous random variables.

   (vi) Differentiate between histogram and bar diagram.

   (vii) Define cumulative distribution function of two dimensional random variable.

   (2, 1, 2, 2, 2, 2, 2)

UNIT I

2. (a) Give an axiomatic definition of probability. Prove that for n events $A_1, A_2, \ldots A_n$,
   $P\{\cup_1^n A_i\} \leq \sum_1^n A_i$.
   When will the equality hold.
   (b)) The outcome of an experiment could be understood in terms of five possibilities; very poor, poor, normal, successful and highly successful. These outcomes were ranked as 1,2, 3, 4 and 5 respectively. One fine day three researchers were asked to perform the experiment. If the ranks of the outcome of the experiment were added for the final declaration of the result, what is the probability that the sum of ranks will be more than 7? (6, 7)

3. (a)What is conditional probability? State the Bayes' Theorem, when A, B and C are the three mutually exclusive and exhaustive events, and D is an event occurring in the same sample space.
   (b) In a village the ratio between male and female population is 3 : 4 and 15% of female are affected by some chronic disease, as against 10% of male. A villager picked up at random happens to be hit by some chronic disease, what is the probability that the person will be male? (6, 7)

4. (a) Define expectation and variance of a random variable. A fair coin is tossed three times. Let X be the number of tails appearing. Find probability distribution of X. Compute the expected value and variance of X.

P.T.O.

(b) Let X_1, X_2 be independent and identically distributed random variables with

$$P(X_i = \pm 1) = \frac{1}{2}, \qquad i = 1, 2$$

Let $X_3 = X_1 X_2$. Show that X_1, X_2, X_3 are pairwise independent but not mutually independent

(7, 6)

5. (a) Suppose that the joint pdf of a two dimensional random variable (X,Y) is given by

$$f(x,y) = x^2 + \frac{xy}{3}, \quad 0 < x < 1, \ 0 < y < 2.$$

Compute (i) $P(Y < \frac{1}{2} | X < \frac{1}{2})$ and (ii) $E(X|Y = y)$.

(b) Define the moment generating function(mgf) of a random variable X. How mgf is useful for finding the moments of the distribution. (8, 5)

UNIT II

6. (a) What are grouped and ungrouped data? What are the considerations that one has to bear in mind while forming a frequency distribution table?

(b) 'Every graph is a diagram but every diagram is not graph' – Discuss. To represent the information on number of patients suffering from seven diseases in a hospital over two years, which diagram/graph is most appropriate and discuss why.

(6,7)

7. (a) Differentiate between qualitative and quantitative variables with examples.

(b) Describe various steps for drawing Box and Whisker plot with examples.

(c) State advantages of stem and leaf presentation with examples.

(3, 5, 5)

8. (a) What do you understand by central tendency? Discuss three measures of central tendency.

(b) The average annual salary of all employees in a company is Rs. 25,000. The average salary of male and female is Rs. 27,000 and Rs. 17,000 respectively. Find the percentage of males and females employed by the company. (7, 6)

9. (a) Why do we need measures of dispersion, when statistics is said to be science of averages? Distinguish between absolute and relative measures of dispersion.

(b) What are skewness and kurtosis? Give some suitable measures of skewness and kurtosis?

(c)The first four central moments of a distribution are 0, 2.5, 0.7, and 18.75. Comment about the skewness and kurtosis of the distribution. (5, 4,4)

x-x-x