'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Minor 1st Semester Examination, 2023

USTAMIN10001-STATISTICS

STATISTICAL METHODS AND PROBABILITY-I

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A

1. Answer any ***five*** questions from the following: 1×5 = 5

(a) Calculate S.D. of the first n natural numbers.

(b) What is skewness?

(c) Median and mode of a distribution is 39 and 37. Find mean value.

(d) What is coefficient of variation?

(e) A coin is tossed 4 times in succession. Find the probability of obtaining one head.

(f) If $P(A \cup B) = \frac{5}{6}$, $P(A \cap B) = \frac{1}{3}$ and $P(A^c) = \frac{1}{2}$, then show that A and B are independent.

(g) If events A and B are not mutually exclusive, then show that

$$P(AB) \geq P(A) + P(B) - 1$$

(h) Show that probability of an impossible event is zero.

GROUP-B

2. Answer any ***three*** questions from the following: 5×3 = 15

(a) Prove that $\frac{m_4}{m_2^2} \geq \frac{m_3^2}{m_2^3} + 1$; where the symbols have their usual meanings.

(b) Show that the combined standard deviation of two distributions pooled together is given by the expression:

$$NS^2 = n_1 s_1^2 + n_2 s_2^2 + \frac{n_1 n_2}{N}(\bar{x}_1 - \bar{x}_2)^2$$

where the symbols have their usual meaning.

(c) If two dice are thrown, what is the probability that the sum is (i) greater than 8 and (ii) not equal to 8?

(d) A bag contains 8 red and 5 white balls. Two successive draws of 3 balls are made without replacement. Find the probability that the first drawing will give 3 white balls and the second, 3 red balls.

(e) State and prove Bayes' theorem.

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20

(a) What are central moments? Establish the relation between central and raw moments. What are the expressions for the first four central moments in terms of raw moments?

(b) The mean and the variance of a group of 100 observations are 6.5 and 3 respectively. 55 of these observations have mean 6.6 and standard deviation 1.5. Find the mean and standard deviation of the remaining 45 observations.

(c) A coin is tossed $(m+n)$ times. Show that the probability of at least m consecutive heads is $\frac{n+2}{2^{m+1}}$.

(d) In a bolt factory, machines A, B, C manufacture respectively 25, 35 and 40 percent of the total. Out of their output 5, 4 and 2 percent are defective bolts. A bolt is drawn from the produce and is found defective. What is the probability that it was manufactured by machine C?

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