SYLHET CADET COLLEGE

TEST EXAMINATION - 2024 | Set | C |
CLASS: XII
STATISTICS (CREATIVE) **Subject Code:** | 1 | 3 | 0 |
SECOND PAPER
TIME – 2 hours & 35 minutes
FULL MARKS – 50

[**N.B.** – The figures of the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any **FIVE** questions taking at least two from each group.]

Group–A

1. **Events that do not depend on each other are called independent events, and events that cannot occurr simulataneously are called disjoint events.**

   (a) Provide an example of disjoint events, using the set theory. 1

   (b) Prove that $P(A \cap \bar{B}) = P(A) - P(A \cap B)$ 2

   (c) If there are k mutually and exhaustive events, prove $\sum_{i=1}^{k} P(A_i) = 1$ 3

   (d) Prove that two events cannot be simulataneously independent and mutually exclusive. 4

2. **Ratul and Tomal both have an unbiased die. Both have randomly thrown their dice once.**

   (a) What are equally likely events? 1

   (b) If a die is thrown once, what is the probability of getting a prime number? 2

   (c) From the stem, what is the probability that the sum of numbers appearing on the dice is greater than 6. 3

   (d) Examine: the probabilities of getting the sum less than 6 and greater than are equal. 4

3. **The probability mass function (pmf) of a football striker scoring no. of hattricks during the course of a league season is given below**

$$P(x) = \frac{|2-x|}{k}; x = 0, 1, 2, 3, 4, 5$$

   (a) What is a random variable? 1

   (b) Is probability a discrete variable? Explain in brief. 2

   (c) Find the value of k. 3

   (d) Find the probability that the no. of hattricks would be less than the expectation. 4

4. **The probability distributions of demand of mobile phones of two operating systems (OS) Android (X) and iPhone OS (iOS) (Y) are:**

Demand	100	200	300	400	500
P(X)	0.1	0.4	m	0.15	0.1
P(Y)	0.09	0.45	0.32	0.11	0.03

   (a) What is Expectation? 1

   (b) Can Expectation be negative? 2

   (c) Find m from the table. 3

   (d) Which OS has higher demand? Analyze. 4

Group–B

5. **A farmer selected a paddy field for seed collection. He found out that 10 out of each 25 paddies are damaged. He collected a sample of 15 paddies.**

   (a) What is a Bernoulli trial? 1

   (b) IF a trail is repeated n times, how many outcomes are generated? Explain. 2

   (c) Find the probability that at least one paddy is damaged? 3

   (d) Comment on the skewness of the data. 4
   [Hint: For a binomial distribution, $\gamma_1 = \frac{q-p}{\sqrt{npq}}$]

6. **Between 1000hrs and 1700 hrs, the average number of phonce calls per minute received by a power distribution company is 2.5.**

   (a) Give an example where Poisson distribution is applicable. 1

   (b) Find the relationship between expectationa and standard deviation of Poisson distribution. 2

   (c) Find the probability that the number of calls is between 1 and 3 (inclusive). 3

   (d) What is the probability that the number of calls received is greater than the average? 4

7. **The frequency distribution of defective items in packets of key rings is given below.**

Number of defective items	0	1	2	3	4	5
Number of packets	76	74	29	17	3	1

   (a) What is another way to write $P(X \geq 1)$? 1

   (b) Can the mean of Poisson distribution be negative? 2

   (c) From the given stem, find mean and variance. 3

   (d) Find the expected frequencies and comment. 4

8. **For projection of population in a future time period, demographers use simple, geometric or exponential growth technique. Each method has its advantages and disadvantages.**

   (a) What is geometric growth? 1

   (b) In geometric growth method, obtain the formula for time required for the population to get doubled [denote rate as r]. 2

   (c) In exponential method, how much unit of time is required for the population to get tripled? 3

   (d) For projecting (predicting future values), is geometric growth method better than the exponential method? Justify. 4