Polaris
SYLHET CADET COLLEGE
TEST EXAMINATION - 2025
CLASS: XII
STATISTICS (CREATIVE)
SECOND PAPER
[According to the Syllabus of 2025]
TIME – 2 hours & 35 minutes
FULL MARKS – 50

Ques Setter	
Moderator	
VP	

Subject Code: | 1 | 3 | 0 |

[**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 questions from each group]

Group - A

1. **An analyst threw a coin and a die simultaneously and thought the events of getting a head from the coin and an even number from the die are independent.**

   (a) What is a disjoint event?　1

   (b) How are disjoint and independent events related?　2

   (c) Find the probability that the analyst does not get a head but gets a number less than 4.　3

   (d) Analyze the thought of the analyst.　4

2. **At CityHub High School, each student studies at least one language— Spanish, French, or Latin—and no student studies all three languages. 100 students study Spanish, 80 study French, 40 study Latin, and 22 study exactly two languages.**

   (a) What is a sample space?　1

   (b) How many different teams of 4 players can be formed from a group of 12 players, always including a certain person?　2

   (c) How many students are there at the High School?　3

   (d) If a student is selected at random, what is the probability that the student studies only one language?　4

3. **The probability function of a discrete random variable is given below:**

$$P(x) = \tfrac{x-3}{6}, \quad \text{for } x = 4, 5, 6$$

   (a) What is the property of a probability distribution regarding the sum of all probabilities?　1

   (b) If $a < b, F(b) - F(a) = ?$ where F is cumulative distribution function? Derive mathematically.　2

   (c) Find $F(x)$ and hence find and explain $F(5)$.　3

   (d) If the range of the function is modified to icnlude 7, how can adjust the function to keep it valid?　4

4. **A random variable is distributed as below:**

$$P(x) = \frac{3x + 4}{21}, \quad x = 0, 1, 2$$

   (a) Write down the formula of $E(X^2)$　1

   (b) If $Y = 5X - 2$, Express $E\left(\tfrac{Y}{3} + 4\right)$ in terms of $E(X)$.　2

   (c) Determine the value of the expectation.　3

   (d) Find $V(4X - 2)$　4

Group - B

5. **A university finds that 8% of its printed course materials contain typographical errors. Each department orders 50 materials per term. Across the university, 600 departments place orders.**

   (a) What is q in a binomial distribution?   1

   (b) What happens if $n = 1$ in Binomial distribution?   2

   (c) What is the probability that a randomly selected department receives at most 3 erroneous materials?   3

   (d) How many departments are expected to receive at least 5 erroneous materials?   5

6. **For a Binomial distribution, arithmetic mean $= 4$ and the variance is 3.**

   (a) What is denoted by X in Binomial distribution?   1

   (b) What is the relationship between the mean, variance, and skewness in a binomial distribution?   2

   (c) Find $P(X = 3)$ 3

   (d) Find and interpret the skewness of the distribution.   4

7. **A website receives user sign-ups following a Poisson distribution, with a mean of 4 per hour.**

   (a) How is the probability mass function (PMF) of a Poisson distribution expressed?   1

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

   (c) What is the probability that exactly 2 or 3 users sign up in an hour?   3

   (d) If $P(a) = P(b)$, comment on the combination of the values of a and b.   4

8. **The cities A and B have the following demographic characteristics:**

City	Area (sq km)	Population	No. of Females
A	10,000	3.2 million	1.9 million
B	15,000	2.15 million	1.1 million

   (a) How is dependency ratio calculated?   1

   (b) Does population density alone determine the suitability of living in a city?   2

   (c) Which city has greater Sex Ratio?   3

   (d) Which country is more comfortable for living? Justify your opinion.   4