SYLHET CADET COLLEGE

PRE-TEST EXAMINATION - 2023 | Set | D |
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. **It is observed that 50% of mails are spam. A software filters spam mail before reaching the inbox. Its accuracy for detecting a spam mail is 99% and chances of tagging a non-spam mail as spam mail is 5%.**

   (a) What is a disjoint event? 1
   (b) For two independent events, what does the Bayes' theorem reduce to? 2
   (c) What is the probability that a mail is tagged as spam? 3
   (d) If a certain mail is tagged as spam find the probability that it is not a spam mail. 4

2. **Two dice are thrown together. The dice are named A and B.**

   (a) What is P(A=7)? 1
   (b) Create the sample space. 2
   (c) What is the probability that the outcomes of A & B are different? 3
   (d) Determine the probability that the summation of outcome of two dice is a prime number. 4

3. $P(A) = \frac{3}{10}, P(B) = \frac{2}{5}, P(B \cup A) = \frac{1}{2}$

   (a) What is an independent event? 1
   (b) What is the relationship between independency and mutual excluvity? 2
   (c) Find $P(A|B)$ and $P(B|A)$ 3
   (d) Verify the equality mathematically & empirically: $P(B) = P(A) \cdot P(B|A) + P(\bar{A}) \cdot P(B|\bar{A})$ 4

4. **A magician draws two cards from a pack (i) with replacement and then (ii) without replacement. The cards were well-shuffled before drawing.**

   (a) What is the probability of an impossible event? 1
   (b) How to determine the probability of a joint event? 2
   (c) As per (i), what is the probability that the cards have different color? 3
   (d) As per (ii), what is the probability that the cardsare aces of same color? 4

Group–B

5. **The probability density function of a continuous random variable is**

$$f(x) = \begin{cases} kx(x-1), & 1 \le x \le 4 \\ 0, & otherwise \end{cases}$$

   (a) What is the range of probability? 1
   (b) Find the value of k 2
   (c) Justify the pdf property of the fucntion. 3
   (d) What is the probability that X is greater than 3? 4

6. **The probability distribution of a random X is provided below:**

X	-1	0	1	2	3
P(x)	$\frac{3}{20}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{3}{20}$

   (a) What is the expectation of a constant m? 1
   (b) Find $E(X)$. 2
   (c) Find $E(Y)$, where $Y = \frac{X}{2}$ 3
   (d) Find Variance of (2X+3). 4

7. **A deck of 52 card is well-shuffled and three cards are drawn from them at random. The number of kings obtained is denoted by x.**

   (a) What are equaly likely events? 1

   (b) Differentiate between with replacement and without replacement. 2

   (c) Form the probability fucntion using the above information and then form the distribution. 3

   (d) Examine the statement: $P(1 \leq x \leq 3) = F(3) - F(1)$ 4

8. **The joint probability function of two random variables X and Y is given below:**

   $P(X, Y) = \dfrac{x + 2y}{16}; x = 0, 1; y = 0, 1, 2, 3$

   (a) Write down the formula of conditional proibability. 1

   (b) What is the relationship between marginal and joint probability? 2

   (c) Find P(X). 3

   (d) Find $P(X|Y)$ and $P(X|0)$. 4

"It is a capital mistake to theorize before one has data." – **Sir Arthur Conan Doyle**