

SYLHET CADET COLLEGE

PRE-TEST EXAMINATION - 2023

CLASS: XII

STATISTICS (CREATIVE)

SECOND PAPER

TIME – 2 hours & 35 minutes

FULL MARKS – 50

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Subject Code:	1	3	0
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[**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 exclusivity? 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 cards are aces of same color? 4

Group–B

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

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

- (a) What is the range of probability? 1
 - (b) Find the value of k 2
 - (c) Justify the pdf property of the function. 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 equally likely events? 1
- (b) Differentiate between with replacement and without replacement drawings. 2
- (c) Form the probability fuction 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:

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

- (a) Write down the formula of conditional proibility. 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

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