

Sylhet Cadet College
Model Test Examination - 2023
Class: HSC

Subject: Statistics Second Paper (Creative)

Time: 2 hour & 35 minutes

Subject Code: 130

Full Marks: 50

Answer FIVE questions taking at least two (2) from each group. Figures in the right indicate full marks.

Group A

1. $P(A|B) = \frac{1}{8}, P(A) = \frac{1}{2}, P(B) = \frac{1}{5}$
 - (a) Write down the range of probability. 1
 - (b) Find $P(A \cap B)$. 2
 - (c) Find $P(A|\bar{B})$. 3
 - (d) Are the probabilities $P(A|B)$ and $P(B|A)$ equal? Justify 4
2. **A red and a blue dice are thrown once. The dice are absolutely neutral and independent.**
 - (a) What is a simple event? 1
 - (b) Give an example of a certain event using set theory. 2
 - (c) Find the probability that the difference of two digits from two dices is less than 3. 3
 - (d) Are the probabilities of getting greater digit from the blue die and that from the red die equal? Justify. 4
3. **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 probability. 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
4. **An urn contains 5 red and 6 white balls. 3 balls are drawn at random. X is the number of white balls drawn.**
 - (a) What does variance measure? 1
 - (b) Can the variance be smaller than standard deviation? 2
 - (c) Find the $E(X)$ from the stem. 3
 - (d) Find the variance from the stem assuming X is the number of red balls drawn. 4

Group B

5. **The probability density function of a continuous random variable is**
$$f(x) = k(x + 1); 0 \leq x \leq 1$$
 - (a) What is a random variable? 1
 - (b) Find the value of k 2
 - (c) Find the probability that the values of x would lie between 0 and 0.5. 3
 - (d) What is the probability that X is greater than 0.8? 4
6. **A farmer plans to store rice seeds for future use. It was found that 8 out of 20 seeds are rotten. He then collected a sample of 15 seeds.**
 - (a) What is Bernoulli trial? 1
 - (b) How are Bernoulli and Binomial distributions related? 2
 - (c) What is the probability that at least one seed is rotten out of 15? 3

- (d) What is the probability that the number of rotten seeds is greater than the arithmetic mean? 4
7. **In winter, the probability that it rains on a particular day is 0.015. An analyst observes 100 winter days.**
- (a) What is an experiment? 1
- (b) When can the Poisson distribution be approximated by the Binomial distribution? 2
- (c) Find, using Binomial distribution, the probability that it would not rain at all on the observed days. 3
- (d) Find the probability in 3(c) using Poisson distribution. 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