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. **A box contains four blue and 6 green balls. 3 balls are drawn randomly.**

   (a) What is the value of ${}^nC_r$? 1

   (b) Illustrate the difference between permutation and combination with an example. 2

   (c) What is the probability that all balls are green? 3

   (d) What is the probabilith that one ball has a different color? 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 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

4. **A box 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