Sylhet Cadet College

Model Test Examination - 2022

Class: HSC

Subject: Statistics 2nd Paper (Creative)

Time: 1 hours & 40 minutes **Subject Code: 130** **Full Marks: 30**

Answer three questions taking at least 1 (one) 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. **It is observed that in a college, there are 100 students, of whom 30 play football, 40 play cricket, and 20 play both.**

   (a) What is a sample space? 1

   (b) What is the relationship between independence and mutual excluvity? 2

   (c) Are the probabilities of playing cricket and that of football independent? Prove. 3

   (d) If a student is selected randomly, and if he plays cricket, what is the probability that he does not play football? 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. **The probability density function of a continuous random variable is**

$$f(x) = \begin{cases} k(x+1), & 0 \leq x \leq 1 \\ 0, & otherwise \end{cases}$$

   (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

Group B

5. **Various sales and their probabilities of a grocery store is given below**

Sales	200	250	275	310	350
Probability	0.10	0.20	0.40	0.25	0.05

   (a) Can the expectation of a random variable be negative? 1

   (b) Find the expected sales of the store on a given day. 2

   (c) Compute the dispersion of sales f the store. 3

   (d) To make the expected sale 280, what sale does the store need in place of 200? 4

6. $P(X) = \frac{3-|4-x|}{k}; x = 2, 3, 4, 5, 6$

   (a) What is the Expectation equivalent to? 1

   (b) Find the value of k. 2

   (c) Determine the value of the expectation. 3

   (d) Find $V(2X - 1)$ 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