Sylhet Cadet College

Progress 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. **An unbiased coin is tossed 10 times.**

    (a) If a coin is flung 3 times, how many outcomes are generated?   1

    (b) If a coin is flung n times, show how many outcomes are generated.   2

    (c) What is the probability of getting a) at least 3 heads, b) at most 3 heads?   3

    (d) Are these probabilities equal? a) Getting at least 2 heads & b) Getting at least 2 tails.
    Also justify logically.   4

2. **The probability distribution of a discrete random variable X is given below:**

x	-2	-1	0	1	3	4
P(x)	0.1	k	2k	3k	4k	0.2

    (a) What is $\Sigma P(x)$?   1
    (b) Find the value of k.   2
    (c) Find $P(X \geq 0)$ and $P(X < 1)$.   3
    (d) Find the cumulative distribution function, F(X) and F(2) and explain.   4

3. **The probability distributions of demand of mobile phones of two operating systems (OS) Android (X) and iPhone (Y) are:**

Demand	100	200	300	400	500
P(X)	0.1	0.4	m	0.15	0.1
P(X)	0.09	0.45	0.32	0.11	0.03

    (a) What is Expectation?   1
    (b) Can Expectation be negative?   2
    (c) Find m from the table.   3
    (d) Which OS has higher demand? Analyze.   4

4. **An umbrella seller earns a revenue of BDT. 5000 if it rains. If it does not rain, he loses BDT. 1000. The probability that it rains on a given day is 0.04.**

    (a) Write down the formula of Expectation for a continuous random variable.   1
    (b) Can the value of Expectation be zero?   2
    (c) What is the umbrella seller's expected revenue?   3
    (d) What should be the minimum probability of raining for him to achieve revenue greater than zero?   4

Group B

5. **The number of defective pen produced by a company follows a binomial distribution with expectation 1.5 and variance 1.125..**

    (a) What is the mean of binomial distribution   1
    (b) Can variance be greater than mean in binomial distribution?   2
    (c) Determine the probability function of the number of defective items produced by the company.   3
    (d) What is the probability that the number of defective items is no less than 3?   4

6. **The number of customers coming at a shop per minute follows a Poisson distribution, whose mean is 3.**

    (a) What is a Poisson variate?   1
    (b) Can the mean of Poisson distribution be negative?   2
    (c) Find the probability that the number of customers coming is between 1 and 2.   3
    (d) Are the probabilities of coming to 2 and 3 customers equal?   4

7. **A can manufacturer observes that 0.1% of the produced cans are faulty. The cans are packaged in carton boxes, with 500 cans in each box. A wholeseller purchases 100 boxes from the manufacturer.**

    (a) What is shape of Poisson distribution?   1
    (b) For a Poisson distribution, P(2) = P (3). What is P(2)?   2
    (c) Find the probability of exactly one defective can.   3

    (d) Find the expected number of boxes with no defective cans.   4

8. **A reseracher uses the following data to know about some demographic characterisics.**

    (a) What is General Fertility Rate?   1

    (b) What is the difference between GRR and NRR?   2

    (c) Compute the population density.   3

    (d) Are TFR and GRR same for this data?   4