

**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.

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**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 density function of a continuous random variable X is given as:**

$$f(x) = \frac{1}{b-a}; a \leq x \leq b$$

- (a) In this distribution, what is P(a)? 1
- (b) What is the shape of the distribution? 2
- (c) Find  $P(a \leq x \leq b)$ . 3
- (d) Find and explain the median of the distribution. 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? 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 wholesaler 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 researcher uses the following data to know about some demographic characteristics.**

- (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