



'সমানো মন্ত্র: সমিতি: সমানী'

**UNIVERSITY OF NORTH BENGAL**

B.Sc. Honours 2nd Semester Examination, 2022

**GE1-P2-STATISTICS**

**FUNDAMENTAL OF PROBABILITY THEORY**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
All symbols are of usual significance.*

**GROUP-A**

1. Answer any **five** questions:

1×5 = 5

- (a) If  $P(A \cup B) = \frac{5}{6}$ ,  $P(A \cap B) = \frac{1}{3}$  and  $P(A^c) = \frac{1}{2}$ , then show that  $A$  and  $B$  are independent.
- (b) The mean and variance of a binomial variate  $X$  are 4 and  $\frac{4}{3}$ . Find  $P(X = 1)$ .
- (c) Show that the chance of throwing an odd number with a die is  $\frac{1}{2}$ .
- (d) What is the chance that a non-leap year selected at random will contain 53 Sundays?
- (e) For a binomial distribution with mean 5 and S.D. 2, find the mode.
- (f) For what value of  $k$ ,  $f(x, y) = ke^{-(x+y)}$ ,  $x \geq 0$ ,  $y \geq 0$  will represent probability density function?
- (g) State the Central Limit Theorem.
- (h) State two properties of hypergeometric distribution.

**GROUP-B**

2. Answer any **three** questions:

5×3 = 15

- (a) State and prove Bayes' Theorem.
- (b) Prove that the variance of binomial distribution is  $npq$ .
- (c) Derive Poisson distribution as the limit of binomial distribution.
- (d) Two persons toss a true coin  $n$  times each. Show that the probability of their scoring the same number of heads is  $\binom{2n}{n} 2^{-2n}$ .

(e) If  $X$  follows binomial distribution with parameter  $n$  and  $p$  then prove that

$$P[X \text{ is even}] = \frac{1}{2}[1 + (q - p)^n] \text{ where } p + q = 1$$

**GROUP-C**

3. Answer any *two* questions: 10×2 = 20

(a) (i) Show that the expectation of the product of two independent random variables is equal to the product of their expectations. 5

(ii) Show that for the binomial distribution 5

$$\mu_{r+1} = p(1 - p)\left(nr\mu_{r-1} + \frac{d\mu_r}{dp}\right)$$

where the symbols have their usual meanings.

(b) (i) In a distribution exactly normal, 7% of the items are under 35 and 89% are under 63, what are the mean and s.d. of the distribution? 5

(ii) Find the points of inflexion of the normal curve. 5

(c) (i) For a normal distribution show that odd order moments about mean are zero. 5

(ii) Find the probability that at most 5 defective fuses will be found in a box of 200 fuses, if experience show that 2% of such fuses are defective. 5

(d) (i) Find the mode of the Poisson distribution. 5

(ii) A coin is tossed until a head appears. What is the expectation of the number of tosses? 5

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