



'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

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

GROUP-B

2. Answer any **three** questions:

5×3 = 15

- State and prove Bayes' Theorem.
- Prove that the variance of binomial distribution is npq .
- Derive Poisson distribution as the limit of binomial distribution.
- 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

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

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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