UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 2nd Semester Examination, 2021

GE2-STATISTICS

Full Marks: 40

ASSIGNMENT

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

GROUP-A

1. Answer any ***four*** questions from the following: 2×4 = 8

(a) State two properties of Normal distribution.

(b) Define Probability density function of a random variable X.

(c) The mean and variance of X are 10 and 4 respectively. Find the variance of $3-4X$.

(d) A die is thrown 108 times in succession. Find the expectation and variance of the number of "six" appeared.

(e) The probability that a patient will die due to heart attack is 0.2. Prove that the probability that out of 20 patients at least one will die is $\{1-(0.8)^{20}\}$.

(f) A coin is tossed 4 times in succession. Find the probability of obtaining one tail.

GROUP-B

Answer any *four* questions from the following 8×4 = 32

2. (a) From a pack of 52 cards, an even number cards is drawn. Find the probability that these consist of half of red and half of black. 4

(b) A point P is taken at random in a line AB of length $2a$. Find the mathematical expectation of $AP \cdot PB$ and that of the difference of $|AP-PB|$. 4

3. (a) Determine the value of k such that $f(x)$ defined by 3

$$f(x) = \begin{cases} kx(1-x) & , \quad 0<x<1 \\ 0 & , \quad \text{otherwise} \end{cases}$$

Is a probability density function.

(b) For the Binomial $(n,\ p)$ distribution prove that $\mu_{r+1} = p(1-p)\left[nr\mu_{r-1} + \dfrac{d\mu_r}{dp}\right]$, where μ_r is the rth central moment. 5

4. State and prove Bayes' theorem. 2+6=8

5. (a) Write down the probability mass function of Normal distribution. 1

   (b) Explain continuous probability distribution. 2

   (c) Find the mean and variance for a normal distribution. 5

6. (a) If A and B are two events such that $P(A) = P(B) = 1$, show that $P(A+B) = 1$. 1

   (b) Find the probability that there may be 53 Sundays in a Leap year. 3

   (c) A box contains 'a' white and 'b' black balls, 'c' balls are drawn. Find the expected value of the number of white balls drawn. 4

7. (a) Define: 1+1

   (i) Axiomatic definition of probability.

   (ii) Mutually exhaustive events.

   (b) If $f(x,\ y) = 3x^2 - 8xy + 6y^2\ (0 < x < 1,\ 0 < y < 1)$, find $f_x(x \mid y)$ and $f_y(y \mid x)$ and show that X and Y are independent. 6

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