B.Sc./2nd Sem (G)/STS/24(CBCS)

2024

2nd Semester Examination

STATISTICS (General)

Paper : DSC 1B/2B/3B-T

(Elementary Probability Theory)

[CBCS]

Full Marks : 40 Time : Two Hours

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

Group - A

Answer any ***five*** of the following questions : $2\times5=10$

1. Give the classical definition of probability.

2. Suppose A and B be two events such that $P(A)=\frac{3}{4}$ and $P(B)=\frac{5}{8}$. Show that $\frac{3}{8}\le P(A\cap B)\le\frac{5}{8}$.

3. For two independent events A and B show that A and B^C are independent.

4. Define a random variable.

5. Define exponential distribution.

P.T.O.

6. Show that normal distribution is a symmetric distribution about its mean.

7. For a random variable X, show that $\left(E\left(X^2\right)\right)^{1/2} \geq E(X)$.

8. Find the value of p for which the binomial distribution having parameters n and p is symmetric.

Group - B

Answer any ***four*** of the following questions : 5×4=20

9. State and prove memoryless property of exponential distribution.

10. Each coefficient in the equation $ax^2+bx+c=0$ is determined by throwing an ordinary die. Find the probability that the equation will have real roots.

11. Show that for $N\left(\mu, \sigma^2\right)$ distribution, $\mu_{2n+1}=0$ and $\mu_{2n}=1\cdot3\cdot5\cdots\cdots(2n-1)\sigma^{2n}$.

12. A coin is tossed until a head appears. Find the expected number of tosses required.

13. Determine the most probable number of successes in a binomial distribution having parameters n and p.

14. Show that for n events $A_1, A_2, \cdots, A_n$, $P\left(\bigcap_{i=1}^{n} A_i\right) \geq \sum_{i=1}^{n} A_i-(n-1)$.

Group - C

Answer any ***one*** of the following questions : $10\times1=10$

15. (a) Suppose $f(x)$ is the pmf of a discrete random variable X given by the relation $f(x)=\frac{\lambda}{x} f(x-1),\, x=1,2,3,\cdots\cdots,$ where $f(x)$ is positive for non-negative integral values of X. Determine $f(x)$.

    (b) State and prove weak law of large number. 5+5

16. (a) If $X \sim P(\lambda)$ then show that

    (i) $P(X \text{ is odd})=\frac{1}{2}\left(1-e^{-2\lambda}\right)$ and

    $P(X \text{ is even})=\frac{1}{2}\left(1+e^{-2\lambda}\right)$

    (ii) $E(|X-1|)=2e^{-\lambda}+\lambda-1$. 5+5