K23U 3749

Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – Supplementary) Examination, November 2023
(2017 – 2018 Admissions)
COMPLEMENTARY COURSE IN STATISTICS FOR GEOGRAPHY/ PSYCHOLOGY CORE
3C03STA : Probability and Distribution Theory

Time : 3 Hours Max. Marks : 40

Instruction *: Use of calculators and statistical tables are* ***permitted.***

PART – A
(Short Answer)

Answer **all** the **6** questions. **(6×1=6)**

1. Give the classical definition of probability.

2. State the addition theorem of probability for two events.

3. Define probability mass function (pmf).

4. Define mathematical expectation.

5. Give the conditions that normal distribution is a limiting case of binomial distribution.

6. Give any two applications of chi-square distribution.

PART – B
(Short Essay)

Answer **any 6** questions. **(6×2=12)**

7. If A and B are independent events, then show that $\overline{A}$ and $\overline{B}$ are also independent.

8. State Bayes' theorem.

P.T.O.

9. If $p(x) = \begin{cases} \frac{x}{15}, & x = 1, 2, 3, 4, 5 \\ 0, & \text{otherwise} \end{cases}$, find P(X = 1 or 2) and P(0.5 < X < 2.5/X > 1).

10. Check f(x) = 6x(1 – x), 0 < x < 1 is a probability density function (pdf).

11. Four fair coins are tossed. Let X is the number of heads occur. Find the probability function of X and hence calculate the mean and standard deviation.

12. In a normal distribution 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution.

13. Define t distribution and give its relation with F distribution.

14. Let X and Y be independent standard normal variates. State the distribution of $\frac{X^2}{Y^2}$.

PART – C
(Essay)

Answer **any 4** questions. **(4×3=12)**

15. Two unbiased dice are thrown. What is the probability that the sum thrown is (i) greater than 8, and (ii) neither 7 nor 11 ?

16. Given the pmf of a discrete random variable X as

$f(x) = \begin{cases} Cx^2, & x = 1, 2, 3, 4 \\ 0, & \text{otherwise} \end{cases}$. Obtain the value of C and the distribution function of X.

17. If the possible values of a random variable X are 0, 1, 2, . . .

Show that $E(X) = \sum_{n=0}^{\infty} p(X > n)$.

18. Obtain the mean and variance of Poisson distribution.

19. Define normal distribution. Give any four properties of normal distribution.

20. If X_1 and X_2 are independent chi-square random variables, each with one degrees of freedom. Find k such that $P(X_1 + X_2 > k) = \frac{1}{2}$.

PART – D
(Long Essay)

Answer **any 2** questions. **(2×5=10)**

21. State and prove Baye's theorem.

22. Given the following table.

x	–3	–2	–1	0	1	2	3
p(x)	0.05	0.10	0.30	0	0.30	0.15	0.10

Compute : (i) E(x), (ii) E(2x + 3), (iii) V(x) and (iv) V(2x + 3).

23. Derive the sampling distribution of sample variance s^2.

24. Fit a binomial distribution to the following data and calculate the theoretical frequencies.

x	0	1	2	3	4
f	28	62	46	10	4