



K24U 3721

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (CBCSS – Supplementary)  
Examination, November 2024  
(2018 Admission)

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 6** questions.

(6×1=6)

1. Define a simple event.
2. What are the axioms of probability ?
3. Define a random variable.
4. Define distribution function of a random variable.
5. Write any two application of chi-square distribution.
6. What is the relation between chi-square and F-distribution.

PART – B  
(Short Essay)

Answer **any 6** questions.

(6×2=12)

7. Define sample space of a random experiment with example.
8. Define probability mass function and probability density function. Also write any two properties of them.

P.T.O.



9. Let  $X$  be a random variable with probability density function.

$X$	-1	0	1
$P(x)$	$11/32$	$1/2$	$5/32$

Find probability density function of (a)  $X^2$  (b)  $X^2 + 2$

10. A discrete random variable  $X$  has the following probability density function.

$x$	-1	0	1	2
$f(x)$	$1/8$	$1/4$	$1/8$	$1/2$

Find  $E(X)$ .

11. Find mean and variance of Poisson distribution with parameter 'm'.
12. State and prove additive property of Binomial distribution  $B(n, p)$ .
13. Derive the sampling distribution of sample mean.
14. Discuss the interrelationships among normal, chi-square and student's t-distribution.

PART - C  
(Essay)

Answer any 4 questions.

(4x3=12)

15. State and prove addition theorem of probability for two events.
16. If  $A$  and  $B$  are two events such that  $P(A) = 1/3$ ,  $P(B) = 1/4$  and  $P(A \cap B) = 1/8$ . Find  $P(A/B)$  and  $P(A/B^c)$ .
17. Define mathematical expectation. State and prove any two properties of expectation.
18. Find the moment generating function of Binomial distribution. Hence find its mean and variance.
19. Define normal distribution. Write any six properties of normal distribution.
20. Define chi-square, student's-t and Snedecor's F-distribution.



PART – D  
(Long Essay)

Answer **any 2** questions.

(2×5=10)

21. A husband and wife appear in an interview for two vacancies in a firm. The probability of husband's selection is  $\frac{1}{7}$  and that of wife's selection is  $\frac{1}{5}$ . What is the probability that

- a) Both of them will be selected
- b) Only one of them will be selected
- c) None of them will be selected

22. Let  $x$  be a continuous random variable with probability density function

$$\begin{aligned} f(x) &= ax, & 0 < x < 1 \\ &= a, & 1 < x < 2 \\ &= -ax + 3a, & 2 < x < 3 \\ &= 0, & \text{otherwise} \end{aligned}$$

- a) Determine the constant  $a$
  - b) Compute  $P(x \leq 1.5)$
23. Define exponential distribution. State and prove lack memory property of exponential distribution.
24. Fit a Poisson distribution for the following data.

<b>x</b>	0	1	2	3	4	5
<b>f(x)</b>	95	75	44	18	2	1