K21U 2109

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (CBCSS – Sup./Imp.) Examination, November 2021
(2015 – '18 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. Define the term "sample space".
2. Define mutually exclusive events.
3. Define discrete random variable.
4. Define distribution function.
5. Give the probability mass function (pmf) of Poisson distribution.
6. Define standard error.

PART – B
(Short Essay)

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

7. Let X denote the number of heads obtained in the flipping of a fair coin twice. Find the probability mass function of X.
8. Prove that $f(x) = 6x(1-x);\ 0 \leq x \leq 1$ is a probability density function.
9. For the random variable X with pdf $f(x) = \begin{cases} 2e^{-2x}, & 0 < x < \infty \\ 0, & \text{otherwise} \end{cases}$, find E(X).
10. Show that if three events A, B and C are independent, then A and $B \cup C$ are independent.
11. Find the variance of a binomial distribution with parameters n and p.

P.T.O.

12. If X is a normal variate with mean 33 and standard deviation 3. Find the probabilities that (a) $25 < X \leq 30$ and (b) $30 < X < 35$.

13. Let X be a continuous random variable with pdf, $f(x) = \begin{cases} kx, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$, where k is a constant. Determine that value of k and find E(X).

14. State the relation between Chi-square and F distribution.

PART – C
(Essay)

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

15. If A and B are any two events, then show that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

16. Consider a discrete random variable X whose pmf is given by

$$p_X(x) = \begin{cases} \frac{1}{3}; & x = -1, 0, 1 \\ 0, & \text{otherwise} \end{cases}$$. Find the mean and variance of X.

17. Give the properties of a distribution function.

18. Derive the mean and variance of exponential distribution with parameter θ.

19. Define sampling distribution and give an example.

20. Give the applications of Normal distribution.

PART – D
(Long Essay)

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

21. State and prove Baye's theorem.

22. For the random variable X with pdf $f(x) = \begin{cases} Ax(1-x), & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$. Find the value of A and also find $E(4X^3)$.

23. State and prove the additive property of chi-square distribution.

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

x :	0	1	2	3	4
f :	123	59	14	3	1