K25U 2953

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (CBCSS – OBE – Supplementary/Improvement) Examination, November 2025
(2019 to 2023 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN STATISTICS FOR B.SC. GEOGRAPHY/PSYCHOLOGY
3C 03 STA (G&P) : 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. Give the classical definition of probability.
2. Define disjoint events.
3. Can two mutually exclusive be independent ?
4. Write down the pdf of a normal distribution with mean 0 and variance 4.
5. A Poisson distribution has mean 2. Write down its pmf.
6. A binomial distribution has mean 4 and variance $\frac{4}{3}$. Find P(X = 0).

PART – B
(Short Essay)

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

7. State multiplication theorem in probability for any two events. Deduce it when the events are independent.
8. State Baye's theorem.

P.T.O.

9. Define pdf of a continuous random variable. What are its properties ?

10. A discrete random variable X takes values –2, –1, 1, 2 each with probability 0.25. Find the expected value of 2X.

11. Give any two properties of binomial distribution.

12. If X is a random variable following Poisson distribution such that P(X = 1) =.P(X = 2). Find P (X = 0).

13. Give the properties of normal distribution.

14. Give the pdf of a chi square distribution with 2 degree of freedom.

PART – C
(Essay)

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

15. State and prove addition theorem in probability for any two events.

16. Define a random variable. Discuss different types of random variables with suitable examples.

17. Check whether the function given by $f(x) = \frac{x}{21}, x = 1, 2, 3, 4, 5, 6$ is a pmf. If it is a pmf, obtain the mean.

18. Give the pdf of exponential distribution. Obtain its distribution function.

19. Obtain the mean of Poisson distribution.

20. Define t distribution and state its properties.

PART – D
(Long Essay)

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

21. Three identical boxes contain respectively 4 white and 3 red balls; 3 white and 7 red balls; 2 white and 3 red balls. A box is chosen at random and a ball is drawn out of it. If the ball is found to be white, what is the probability that second box was selected ?

22. Let X discrete random variable with P(X = 0) = 0.25, P(X = 1) = 0.125, P(X = 2) = 0.125 and P(X = 3) = 0.5. Graph the pmf and cdf of X.

23. A machine in a factory produces components continuously. Each day a sample of 20 components are selected and tested. Over a period of 30 days the number of defective components in the sample is recorded as follows. Fit a Poisson distribution and calculate expected frequencies.

No. of defectives per sample	0	1	2	3	4	5
No. of Samples	9	9	7	3	2	0

24. If X_1, X_2, X_3 be a random sample from N $(0,\sigma^2)$, what is the distribution of $\frac{x_1^2 + x_2^2 + x_3^2}{\sigma^2}$? State the sampling distribution of the statistics $\frac{\sqrt{2}x_1}{\sqrt{x_2^2 + x_3^2}}$ and $\frac{x_1^2}{x_2^2}$.