 Reg No:................
Name:................

Third Semester FYUGP Degree Examination NOVEMBER 2025

KU3DSCSTA221 - PROBABILITY DISTRIBUTIONS

2024 Admission onwards

Time : 1.5 hours Maximum Marks : 50

Section A

Answer any 6 questions. Each carry 2 marks.

1. Define the mathematical expectation of a continuous random variable.
2. Suppose X and Y are independent random variables with $E(X) = E(Y) = 2$. Find $Cov(X, Y)$.
3. Write down the m.g.f. of an exponential distribution with parameter θ.
4. What is the mean of $U(3, 8)$ distribution?
5. Prove that coefficient of correlation for two independent random variables is zero.
6. Comment on the following, giving examples, if possible m.g.f. of a random variable always exist.
7. Determine the binomial distribution for which the mean is 4 and standard deviation is $\sqrt{3}$.
8. The probability of a Poisson variable X having the values 1 and 2 are same. Find $P(X \geq 1)$.

Section B

Answer any 4 questions. Each carry 6 marks.

9. The joint p.d.f. of X and Y is $f(x, y) = a^2 e^{-a(x+y)}$; $0 < x < \infty$, $0 < y < \infty$. Verify whether X and Y are independent.
10. Prove that $V(X) = V(E(X|Y)) + E(V(X|Y))$.
11. Define the characteristic function of a random variable. Show that the characteristic function of the sum of two independent variables is equal to the product of the respective characteristic functions.
12. An integer from 1 to 200 is chosen at random, what is its expected value and variance?
13. For a Poisson random variable X, $P(X = 1) = P(X = 2)$. Find $P(X > 3)$.

14. Find the m.g.f. of Poisson distribution. Find its mean and variance.

Section C

Answer any 1 questions. Each carry 14 marks.

15. (i) Define raw moments. Derive the formula for r^{th} raw moment of a discrete and continuous random variable. Illustrate with examples. (ii) Discuss the importance of raw moments in statistics. How are they useful in deriving central moments?

16. Explain the properties of normal distribution.