K23U 3452

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, November 2023

(2019 to 2022 Admissions)

COMPLEMENTARY ELECTIVE COURSE IN STATISTICS FOR MATHEMATICS/COMPUTER SCIENCE

3C03STA : Probability Distributions

Time : 3 Hours | Max. Marks : 40

PART – A
(Short Answers)

Answer **all** questions. **(6×1=6)**

1. Define mathematical expectation.
2. What is the value of characteristic function when t = 0 ?
3. What is the mean of X following Poisson distribution with standard deviation 2 ?
4. For a geometric distribution, comparing mean and variance which is larger ?
5. Give the mean of rectangular distribution on (a, b).
6. Write the probability density function of an exponential random variable with mean 0.2.

P.T.O.

PART – B
(Short Essay)

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

7. For two random variables, prove that $Cov(X + Y, X - Y) = V(X) - V(Y)$.
8. Define conditional variance.
9. Obtain moment generating function of geometric distribution.
10. Given moment generating function of X as $(0.4 + 0.6e^t)^8$. Find $P(X > 0)$.
11. Define beta distribution of first kind.
12. Write down four properties of normal distribution.
13. What do you mean by sampling distribution of statistic ?
14. If X and Y are independent standard normal random variables, identify the probability distributions of (i) X^2 and (ii) $(X^2 + Y^2)$.

PART – C
(Essay)

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

15. For two independent random variables X and Y, prove that $E(XY) = E(X)\,E(Y)$.
16. Prove that $M_{aX+b}(t) = e^{bt} M_X(at)$.
17. Show that Poisson distribution $P(\lambda)$ is bimodal when λ is an integer.
18. Determine the binomial distribution for which the mean is 4 and standard deviation is $\sqrt{3}$.
19. State and prove lack of memory property of exponential distribution.
20. Find $P(Z < 2)$ and $P(Z > -1)$, where Z follow standard normal distribution.

PART – D
(Long Essay)

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

21. Two random variables X and Y have the following joint probability density function :

$$f(x,y) = f(x) = \begin{cases} 2 - x - y; & 0 \le x \le 1,\ 0 \le y \le 1 \\ 0 \quad ; & \text{otherwise} \end{cases}$$

find :

i) V(X) and V(Y).

ii) Covariance between X and Y.

22. Derive Poisson distribution as a limiting form of binomial distribution.
23. If X is normal variate with mean 30 and S.D. 5, find

i) $P(26 \le X \le 40)$

ii) $P(X \ge 45)$

iii) $P(|X - 30| > 5)$

24. Define gamma distribution, state and establish additive property of Gamma distribution.