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 :

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

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.