K21U 1853

Reg. No. : ....

Name : ....

III Semester B.Sc. Degree CBCSS (OBE) Reg./Sup./Imp. Examination, November 2021
(2019-2020 Admission)
COMPLEMENTARY ELECTIVE COURSE IN STATISTICS FOR MATHEMATICS/COMPUTER SCIENCE
3C03STA : Probability Distributions

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. Define raw moments and central moments.
2. Define characteristic function. State any one of its properties.
3. Find the mean and variance of the distribution whose MGF is $M(t) = (0.4e^t + 0.6)^6$.
4. If X is a Poisson random variable such that $E(X^2) = 6$, find E(X).
5. What do you mean by the memory less property of exponential distribution ?
6. Define beta distribution of I kind.

PART – B
(Short Essay)

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

7. Find the mean and variance of the random variable X with probability density function $f(x) = 6x(1 - x), 0 \le x \le 1$.

P.T.O.

8. If (X, Y) is a bivariate continuous random vector, then define the conditional mean and conditional variance of X given Y.

9. Define geometric distribution. Write a situation where geometric distribution has an application.

10. If X and Y are independent Poisson random variables with parameters α and β, then find the distribution of X + Y.

11. Obtain the MGF of gamma distribution with one parameter.

12. Let X follows rectangular distribution over [0, 1], find the distribution of – 2logX.

13. Define a statistic. Give an example.

14. Write down the PDF of t and F distributions.

PART – C
(Essay)

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

15. If X and Y are random variables, then show that $[E(XY)]^2 \leq E(X^2)E(Y^2)$.

16. Obtain the characteristic function of binomial distribution and hence find its mean and variance.

17. Let X and Y be independent geometric random variables with parameter p. Find the conditional distribution of X given X + Y.

18. Derive the expression for the r-th raw moments of the beta distribution of first kind with parameters (α, β) and hence find the mean and variance.

19. The marks obtained by the students in Mathematics, Physics and Chemistry in an examination are normally distributed with means 52, 50 and 48 and with standard deviation 10, 8 and 6 respectively. Find the probability that a student selected at random has secured a total of 180 marks or above.

20. Define chi-square distribution. Establish the additive property of chi-square distribution.

PART – D
(Long Essay)

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

21. The joint probability mass function of two discrete random variables X and Y is given below. Find (i) a (ii) $E(X|Y = 1)$ and (iii) $Var(Y|X = 0)$.

X	Y		
	1	2	3
0	a	2a	a
1	3a	2a	a
2	2a	a	2a

22. Derive the recurrence relation for the central moments of binomial distribution and hence find the first four central moments.

23. Derive the expression for the central moments of order r of the normal distribution with mean μ and standard deviation σ, where r is a positive integer.

24. Explain the applications of χ^2, t and F distributions.