Reg. No. : ....

Name : ....

K20U 1852

III Semester B.Sc. Degree CBCSS (OBE) – Regular Examination, November 2020
(2019 Admission Only)
Complementary Elective Course in Statistics
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. If X is a random variable, show that $E(X^2) \geq [E(X)]^2$.
2. State the addition theorem on expectation.
3. The mean of a binomial distribution is 4. If n = 6, find P (X ≥ 1).
4. If X and Y are independent Poisson random variables with mean 1, find P(X + Y = 2).
5. Find the mean of rectangular distribution over the interval [–a, a].
6. Define beta distribution of I kind.

PART – B
(Short Essay)

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

7. Define raw moments and central moments. State the relation between them.
8. If X is a random variable for which E(X) = 10 and Var(X) = 25. Find the value of a and b such that the random variable aX – b has mean 0 and variance 1.
9. Find the mean and variance of the discrete uniform random variable, which takes values 1,2,..,n.
10. In eight throws of a die, 5 or 6 are considered to be success. Find the expected number of successes and the standard deviation.
11. The time required to repair a machine is exponentially distributed with mean 2 hours. What is the probability that the repair time exceeds 2 hours ?
12. Write down the MGF of gamma distribution with one parameter and hence find its mean.

P.T.O.

13. Define the terms
    i) sampling distribution
    ii) standard error.

14. Define F statistic. Write down the PDF of F distribution.

PART – C
(Essay)

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

15. Two random variables X and Y have the joint probability density function $f(x, y) = 2 - x - y$; $0 \le x \le 1$, $0 \le y \le 1$ and 0 otherwise. Find the covariance between X and Y.

16. Establish the lack of memory property of geometric distribution.

17. Obtain the MGF of Poisson distribution and hence find its mean and variance.

18. Let $X_1, X_2, \ldots, X_n$ be n independent random variables following $N(\mu_i, \sigma_i)$, i = 1,2, ..., n. Derive the distribution of $\sum_{i=1}^{n} X_i$.

19. If X is a random variable following beta distribution of II kind, then show that $Y = \frac{1}{1+X}$ follows beta distribution of I kind.

20. Explain the relationships between χ^2, t and F distribution.

PART – D
(Long Essay)

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

21. The joint PDF of (X,Y) is given by $f(x,y) = 24xy$; $x > 0$, $y > 0$, $x + y \le 1$ and = 0 elsewhere. Find
    i) $E(Y|X)$ and
    ii) $E(X|Y)$.

22. Derive the Poisson distribution as a limiting case of a binomial distribution.

23. Explain the important properties of normal distribution.

24. Derive the sampling distribution of the sample variance of a random sample from normal population.
