K23U 2009

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, April 2023
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN STATISTICS
2C02STA : Probability Theory and Random Variables

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. What is a sigma field ?
2. What are the characteristics of random experiment as compared to deterministic experiment ?
3. State multiplication theorem.
4. If A and B are two events what can you say about independence of A^C and B ? Justify.
5. Give the applications of Bayes' theorem.
6. Give the domain and co-domain of a distribution function.

PART – B

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

7. Explain mutually exclusive and exhaustive events.
8. An urn contains 7 red and 4 blue balls. Two balls are drawn at random with replacement. Find the probability that they are one red ball and one blue ball.

P.T.O.

9. Define independence of three events.

10. A pair of fair dice is thrown. What is the probability that the sum of faces shown is 8 or more, if 4 appears on the first die ?

11. A continuous random variable had pdf given by f(x) = 2x, 0 < x < 1 and 0, elsewhere. Obtain its distribution function and hence find out P(0.25 < X < 0.75).

12. What are the properties of probability mass function ?

13. A random variable X takes values 0, 1, 2 and 3 with respective probabilities 0.1, 0.3, 0.5 and 0.1. Obtain the pmf of $Y = X^2 + 2X$ and find its mean.

14. How do you define conditional distribution for continuous type bivariate random variable (X, Y) ?

PART – C

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

15. Give axiomatic definition of probability, with clearly mentioning the terms involved.

16. Two persons throw a die alternately till one of them gets a '3' and wins the game. Find their respective probabilities of winning the game.

17. Using axiomatic approach prove that $P(A^C) = 1 - P(A)$.

18. What do you mean by total probability rule ?

19. Write down the properties of a distribution function of a continuous type random variable.

20. A gun is aimed at a certain point, say origin of the coordinate system. Because of the random factors, the actual hit point can be any point (X, Y) in a circle of radius R about the origin. Assume that the joint density function of X and Y is constant in this circle, say $f(x) = \begin{cases} k, & x^2 + y^2 \le R^2 \\ 0, & \text{otherwise} \end{cases}$, find the value of k.

PART – D

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

21. State and prove Boole's inequalities.

22. Describe mutual independence of n event. Show that pair wise independence may not lead to mutual independence.

23. A random variable has pdf given by $f(x) = \frac{3}{4}x(2-x), 0 < x < 2.$ Find its

    i) mean

    ii) variance

    iii) moment measure of skewness and

    iv) mean deviation about mean.

24. The joint density function of X and Y is given by $f(x, y) = \begin{cases} 2, & 0 < x < 1, 0 < y < x \\ 0, & \text{otherwise} \end{cases}$.
    Obtain the marginal densities and find the conditional density of Y given X.