K20U 0485

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree CBCSS (OBE) Regular Examination, April 2020
(2019 Admission)
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** questions : **(6×1=6)**

1. Define a sigma field with example.
2. Define statistical regularity.
3. Define independence of two events.
4. What do you mean by posterior probabilities ?
5. If $B \subset C$ and $P(A) > 0$ then show that $P(B|A) \leq P(C|A)$.
6. Obtain the distribution function of a random variable X with p.d.f. $f(x) = e^{-x}$, $x \geq 0$.

PART – B
(Short Essay)

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

7. Define the terms 'Sample space', 'event' and 'probability space'.
8. What is the probability of getting 53 sundays in a non leap year ?
9. State and prove multiplication theorem for probability.
10. If A and B are independent events. Show that A^c and B^c are independent.
11. Show that the distribution function is non-decreasing.
12. A random variable X has p.d.f. $f(x) = 2x$, $0 < x < 1$. Evaluate $P\left(X > \frac{3}{4} \middle| X > \frac{1}{2}\right)$

P.T.O.

13. The p.d.f. of a random variable X is given by $f(x) = e^{-x}, x \geq 0$. Find the p.d.f. of $Y = 3X + 5$.

14. The joint p.d.f. two random variables X and Y is $f(x, y) = e^{-(x+y)}, x, y \geq 0$. Check whether the random variables are independent.

PART – C
(Essay)

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

15. Define a probability measure.

16. State and prove addition theorem of probability. Extend the theorem in case of three events.

17. It is 8:5 against the wife who is 40 years old living till she is 70 and 4:3 against her husband now 50 living till he is 80. Find the probability that (1) both will alive (2) non will be alive (3) only wife will be alive.

18. Distinguish between pair wise independent and mutual independent events.

19. Obtain the distribution of the sum of numbers when two unbiased dice are thrown.

20. The joint p.d.f. of (X, Y) is given by $f(x, y) = e^{-y}, x > 0, y > 0$. Find $P(X > 1/Y < 5)$.

PART – D
(Long Essay)

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

21. For any n events $A_1, A_2, \ldots, A_n$ prove that $P\left(\bigcup_{i=1}^{n} A_i\right) \leq \sum_{i=1}^{n} P(A_i)$.

22. Prove or disprove 'pair wise independent implies mutual independent'.

23. A random variable X with p.d.f. $f(x) = \begin{cases} kx & 0 \leq x < 1 \\ k & 1 \leq x < 2 \\ -kx + 3k & 2 \leq x < 3 \\ 0 & \text{otherwise} \end{cases}$

    Find the value of *k* and the corresponding distribution function.

24. Find the marginal and conditional distributions of (X, Y) with joint p.d.f. $f(x, y) = 2, 0 < y < x < 1$.