Reg. No :...............................

Name :....................................

**BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024**
**2023 ADMISSIONS REGULAR**
**SEMESTER II - CORE FOR COMPUTER APPLICATIONS**
**ST2C02B23 - Probability and Random Variables**

Time : 3 Hours
Maximum Marks : 80

## Part A

**I. Answer any Ten questions. Each question carries 2 marks**
(10x2=20)

1. Distinguish between direct and inverse correlation.

2. How will you identify whether the correlation is positive or negative?

3. What is a Scatter diagram?

4. Give the standard error estimates of two regression lines.

5. State the properties of regression co-efficients of a bivariate data.

6. Establish the relationship between the correlation coefficient and the two regression coefficients of a bivariate data.

7. Define conditional probability.

8. If A, B, C are three events such that $P(A) = P(B) = P(C) = 1/2$, $P(AB) = P(AC) = 1/3$ and $P(BC) = 0$ Find $P(A \cup B \cup C)$.

9. Distinguish between discrete and continuous sample spaces with suitable examples.

10. The joint p.d.f. of a bivariate random variable (X,Y) is $f(x,y) = x+y$; 0

11. The joint p.d.f. of a bivariate random variable (X,Y) is $f(x,y) = x+y$; 0<x<1, 0<y<1, find the marginal p.d.f. of X.

12. Given that $f(x) = e^{-x}$; $x \geq 0$ is the p.d.f. of a random variable X, find the p.d.f. of $Y = 7 - 3X$

## Part B

**II. Answer any Six questions. Each question carries 5 marks**
(6x5=30)

13. Derive the formula of rank correlation coefficient.

14. Find the Spearman's rank correlation co-efficient from the following data

| Sales | 50 | 50 | 55 | 60 | 65 | 65 | 65 | 60 | 60 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|
| Expenses | 11 | 13 | 14 | 16 | 16 | 15 | 15 | 14 | 13 | 13 |

15. Given the two regression lines $8x - 10y + 66 = 0$ and $40x - 18y = 214$, identify the equations and find $\overline{x}$, $\overline{y}$ and $r$.

16. If two regression equations are $4y = 9X + 15$, $25 X = 6Y + 7$. Identify the regression equations and obtain the mean values of X and Y.

17. Prove that if A and B are such that $P(A) \neq 0$, $P(B) \neq 0$ and A is independent of B, then B is independent of A.

18. Box I contains 2 red and 3 white balls and box II contains 4 red and 7 white balls. Two balls are transferred from box I to box II and then three balls are drawn out from box II. What is the probability of getting 2 red and 1 white balls?

19. $f(x) = x/15$, $x = 1,2,3,4,5$ and 0 elsewhere is the density function of the random variable X. Find its distribution function. Find $P(1 < x < 2)$ and $P(1/2 \leq x \leq 5/2)$.

20. Define joint probability distribution function and give its properties.

21. Write down the probability distribution of X and Y, where X denotes the sum of the numbers obtained and Y denotes the maximum of the numbers obtained, when two unbiased dice are tossed.

## Part C

### III. Answer any Two questions. Each question carries 15 marks (2x15=30)

22. Find Karl Pearson's co-efficient of correlation and Spearman's rank correlation co-efficient from the following data

| x | 90 | 82 | 82 | 82 | 81 | 71 | 63 | 63 | 49 | 38 |
|---|----|----|----|----|----|----|----|----|----|----|
| y | 75 | 72 | 71 | 71 | 71 | 71 | 50 | 40 | 32 | 32 |

23. The following table gives the heights (in inches) of fathers and sons. Estimate the height of the son when the father's height is 64 inches.

| Ht of Father | 65 | 66 | 67 | 68 | 69 | 71 | 73 | 70 | 72 |
|--------------|----|----|----|----|----|----|----|----|----|
| Ht of Son | 30 | 42 | 45 | 46 | 33 | 34 | 40 | 35 | 39 |

24. (a) State and prove Baye's theorem. (b) Two classes A & B consists of 25 boys, 15 girls and 20 boys, 30 girls respectively. One student is selected at random and found to be a girl. Find the probability that she was from class B.

25. The joint p.d.f of (X,Y) is $f(x, y) = \dfrac{x + y}{21} : x = 1, 2, 3$ and $y = 1, 2$. Find

(i) $f(x/y = 2)$ and $f(y/x = 3)$

(ii) The p.d.f. of X+Y

(iii) Examine whether X and Y are independent.