**TB182420A** **Reg. No:...............................................**

**Name:...................................................**

**B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2019**
**(2018 Admission Regular)**
**SEMESTER II – COMPLEMENTARY COURSE (STATISTICS)**
**ST2C01B18 - PROBABILITY AND RANDOM VARIABLES**
**(For Mathematics and Physics)**

**Time: Three Hours** **Maximum Marks: 80**

***Use of Scientific calculators and Statistical tables are permitted.***

## PART A

**I. Answer any ten questions. Each question carries 2 marks.**

1. If the correlation coefficient is 1, what is the angle between the regression lines?
2. What is multiple correlation?
3. If 3x+2y=8 and 4x+5y=18 are the regression lines, find the regression coefficients between them?
4. If f(x) = k x for x=1,2,3 is a probability density function, find k.
5. When will you say two random variables are independent?
6. What is the probability of getting a multiple of 3, When two dice are thrown and the sum of the numbers on the faces turning up are taken.
7. What are the normal equations for fitting a curve of the form $y=a.e^{bx}$?
8. Find the probability of getting 3 spades and 2 diamonds when 5 cards are drawn from a pack of cards.
9. Give the axiomatic definition of probability.
10. For two independent events A and B, Prove that A' and B' are independent.
11. The distribution function of X is F(x). If F(-1)=0 and F(3)=1, find F(-2) and F(-5).
12. Describe the principle of least squares.

**(10x2 = 20)**

## PART B

**II. Answer any *six* questions. Each question carries 5 marks**.

13. Define Spearman's rank correlation coefficient and derive the formula for the same.
14. Two regression lines are 7x-2y=29 and 5x-11y+8=0. Find the
    1) Ratio of variances of X,Y
    2) Correlation coefficient.
15. Describe the method of fitting a straight line to a given data.
16. What do you mean by regression? Derive the equations of the regression lines.
17. State and prove addition theorem of probability.
18. Prove or Disprove." Pair wise independence does not imply mutual independence".
19. The distribution function of a random variable X is given by
    $F(x)=\frac{1}{4}x(3x-x^2), 0\le x\le 2$, find its pdf and obtain $P(0.5\le X\le 1.5)$.

20. Two unbiased coins are tossed. Let X=1, if the first coin shows head and X=0, if it shows tail and Y denote the number of heads thrown. Write the joint probability function.

21. For the joint density function:

$$f(x, y) = \frac{2}{3}(1 + x)e^{-y}, 0 < x < 1, y > 0$$
$$= 0, elsewhere$$

Obtain the conditional distribution of X given Y=1.

**(6x5 = 30)**

## PART C

**III. Answer any two questions. Each question carries 15 marks.**

22. (a) State and prove Baye's theorem.

(b) The contents of three bags are:

$1^{st}$ bag: 4 white and 3 red balls

$2^{nd}$ bag: 7 white and 4 red balls

$3^{rd}$ bag: 3 white and 6 red balls

One bag is selected at random and a ball is drawn from it. If it is found to be white, what is the probability that it is from $2^{nd}$ bag?

23. a) Derive the formula for rank correlation coefficient.

b) From the following information, obtain the correlation coefficient:

$$n = 12, \sum x = 30, \sum y = 5, \sum x^2 = 670, \sum y^2 = 285, \sum xy = 334$$

24. If f(x,y)= c ( x+y) for x=0,1,2 and y=1,2 is the joint distribution of ( X,Y), find (a) c (b) the conditional distribution of X given Y=2. Also examine whether X and Y are independent.

25. Two variables gave the following data: $\overline{X} = 20, \overline{Y} = 15, \pm_x = 4, \pm_y = 3, r = +0.7$

Obtain the two regression equations and find the most likely values of y when X=24.

**(2x15 = 30)**