TB252996C

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

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

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025

2018, 2019, 2020, 2021, 2022 ADMISSIONS SUPPLEMENTARY

SEMESTER II - COMPLEMENTARY COURSE 1 (STATISTICS)

ST2C01B18 - 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. What are the different types of Correlation?
2. Distinguish between direct and inverse correlation.
3. State the properties of Karl Pearson's co-efficient of correlation.
4. Show that correlation coefficient is the G.M of two regression coefficients .
5. Give the standard error estimates of two regression lines.
6. Why are there two regression lines for a bivariate data?
7. What is a random experiment?
8. Give the frequency definition of probability.
9. If $P(A) = P_1$, $P(B) = P_2$ and $P(AB)= P_3$, find $P(A/B)$
10. Examine whether the following is a density function.

$$f(x) = \begin{cases} 2x & \text{if } 0 < x \le 1 \\ 4 - 2x & \text{if } 1 < x < a \\ 0 & \text{elsewhere.} \end{cases}$$

11. If $f(x,y) = \dfrac{xy^2}{30}$; $x = 1,2,3$; $y = 1,2$ is the joint p.d.f. of (X,Y), find the marginal p.d.f. of Y.
12. Let X be a random variable with P.d.f., $f(x) = \dfrac{x}{4}$: $-1 \le x \le 3$ and 0 elsewhere. Find the p.d.f. of $Y = 2X + 3$

Part B

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

13. Show that correlation co-efficient is independent of change of origin and scale.
14. Derive the formula of rank correlation coefficient.
15. For a bivariate data with variables *x* and *y*, show that $s_y^2 = \sigma_y^2(1 - r^2)$, where s_y is the standard error of the estimate of *y*
16. How can the two regression lines be identified?
17. Define joint probability distribution function and give its properties.
18. Three newspapers A, B and C are published in a city and a recent survey of readers indicate the following: 20% read A, 16% read B, 14% read C, 8% read A & B, 5% read A & C, 4% read B & C and 2% read A, B & C. If a person is chosen at random from the city, find the probability that (i) the person reads none of the newspapers, (ii) the person reads exactly one of the newspapers.

19. An unbiased die is tossed till an odd number appears. Obtain the probability distribution of the number of tosses.

20. A random variable X has p.d.f. $f(x) = \frac{1}{4}$; $-2 < x < 2$. Obtain the p.d.f. of $Y=X^2$.

21. Given f(x,y) = C(x+y) for (1,1) , (2,1) , (2,2) , (3,1) and 0 elsewhere. Find C and the marginal densities of x and y.

Part C

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

22. Calculate the Karl Pearson's co-efficient of correlation from the following data

Y \ X	0-5	5-10	10-15	15-20	20-25
0-20	12	6	--	--	--
20-40	2	18	4	2	1
40-60	--	4	7	3	--
60-80	--	1	--	2	1
80-100	--	--	1	2	3

23. If the registration equations are Y = 0.516 x + 33.73 and X = 0.512y + 33.52. Find (a) mean values of x & y.
    (b) Co-relation coefficient r
    (c) Ratio of variances of x & y
    (d) Ratio of coefficient of variation.

24. (a) Explain the terms aposteriori probability and apriori probability. (b) In a certain college, 50% of the students are from the East, 30% from Mid-west and 20% from Far-west. 80% of the Easterners, 60% of the Mid-westerners and 40% of the Far-westerners wear ties. Find the probability that a student who wears tie come from the East.

25. Given the following bivariate Probability distribution,

Y \ X	-1	0	1
0	1/15	1/15	2/15
1	3/15	2/15	1/15
2	2/15	2/15	1/15

Find (i) Marginal distributions of X and Y
(ii) Conditional distribution of X given Y = 1
(iii) Examine whether X and Y are independent