Reg. No .... Name **24U250**

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024
SEMESTER 2 - STATISTICS FOR MATHEMATICS AND COMPUTER APPLICATIONS
COURSE : **19U2CPSTA02/19U2CRSTA02 - PROBABILITY AND STATISTICS**
(For Regular - 2023 Admission and Improvement / Supplementary – 2022/2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 75

(Use of Scientific calculator and statistical tables are permitted)
PART A
(Each Question carries 1 mark. Maximum marks from this part is 10)

1. Give axiomatic definition of probability.

2. $If \ F(x) \ = \ 0 \ if \ x < 0$
   $\qquad = \ x \ if \ 0 \le x \le 1$
   $\qquad = \ 1 \ for \ x \ge 1$
   $Find \ P\left[4x + 5 \le 6.3\right]$

3. Given $P(A) = \ 0.4 \ P(B) = \ 0.3 \ and \ P(A \cup B) = 0.5. \ \ Find \ P(A/B)$?

4. Give the simplest expression of $(A \cap B) \cup (A \cap B^c)$

5. Examine whether the following is a p.d.f.
   $f(x) \ = \begin{cases} \frac{1}{3} \ for \ x = -1 \\ \frac{1}{3} \ for \ x = 0 \\ \frac{1}{3} \ for \ x = 5 \\ 0 \ otherwise \end{cases}$

6. Define sample space and write the sample space in an experiment of tossing two coins.

7. The mean values of two variables X and Y are 5 and 8 respectively. If one of regression lines between them is 6X-2Y-k=10, then find k?

8. The joint p.d.f f(x,y) is given by f(x,y) = e^{-y}; x>0, y>0. Find the marginal distribution of X ?

9. Find the point through which the two regression lines passes.

10. If f(x) =k for -4<x<-1 is a probability distribution function, then find k

11. Define conditional distributions of bivariate random variable (X,Y)

12. If the regression lines are perpendicular , Obtain the values of correlation coefficient.

PART B
(Each question carries 3 marks. Maximum marks from this part is 15)

13. What are the important defferences between correlation and regression coefficients?

14. Explain why there are two regression lines.

15. Show that the distribution function is non-decreasing

16. Define joint probability distribution function and state its properties

17. Use the axioms of porbability to show that P(A)≤P(B)whenever A is a subset of B

18. Explain the terms ' apriori probabilities' and posteriori probabilities in connection with Baye's theorem

19. Distinguish between p.d.f. and distribution function of a random variable (continuous case). How are the two function related?

PART C
(Each question carries 5 marks. Maximum marks from this part is 20)

20. The following are the marks obtained by 8 students in Mathematics and Statistics. Obtain the rank correlation between the marks

Marks in Maths	35	12	43	30	62	30	25	54
Marks in Statistics	40	25	60	52	45	40	20	38

21. If f(x,y) = kx^2 (1-y) for 0<x<2, 0<y<1 is the joint p.d.f of (X,Y) find (i) k (ii) find the marginal distribution function of X and Y

22. Define independent and mutually exclusive events. Can two events be mutually exclusive and independent simultaneously? Support your answer with an example.

23. What do you mean by rank correlation? Derive an expression for the rank correlation coefficient

24. If A and B are independent events show that (1) A and B' are independent (2) A' and B are independent (3) A' and B' are independent

25. For the distribution function $F\left(x\right) \; = \; 0 \; if \; x < -2$

$$= \; \frac{x+2}{4} \; -2 \leq x \leq 2$$
$$= \; 1 \; x \geq 2$$
$$Compute \; \left(1\right) \; P\left[\frac{-1}{2} \; < x < \frac{1}{2}\right] \; \left(2\right) \; P\left[2 < x \leq 3\right]$$

PART D
(Each question carries 10 marks. Maximum marks from this part is 30)

26. Find the value of k and examine whether X and Y are independent if the joint density function of X and Y is given by $f\left(x,y\right) \; = \; k\left(2x + 3\right) \; e^{-\frac{y}{2}}$,0<x<2, y>0

27. A continuous random variable X has the following density
function $f(x) = \; ax, \qquad 0 \leq x \leq 1$
$$= \; a, \qquad 1 \leq x \leq 2$$
$$= \; -ax + 3a, \; 2 \leq x \leq 3$$
$$= \; 0 \; elsewhere$$
(1) Determine the constant a (2) Determine the distribution function (3) sketch the graphs of f(x) and F(x)

28. (a) State and prove Baye's Theorem (b) The contents of three urns I, II, III are as follows: one white two black and three red balls, two white one black and one red balls and four white five black and 3 red balls. One urn is chosen at random and two balls are drawn. They happened to be white and red. What is the probability that they come from urn II

29. A company wanted to assess the impact of R and D expenditure (X) on annual profit (Y) based on the following data fro past 8 years.. Find the regression equation Y on X. Estimate the profit for R and D expenditure of 8 lakhs

X	9	7	5	10	4	5	3	2
Y	45	42	41	60	30	34	25	20