B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH/APRIL 2019

SEMESTER - **2: STATISTICS** FOR MATHEMATICS AND COMPUTER APPLICATIONS

COURSE: **15U2CPSTA2-15U2CRCST2: PROBABILITY AND STATISTICS**

(Common for Regular 2018 / Supplementary/Improvement 2017/ 2016/2015 Admission)

Time: Three Hours 						Maximum Marks: 75

Use of Scientific calculators and Statistical tables permitted

PART A

Answer all questions. Each question carries 1 mark.

1. Define a random experiment.
2. Are mutually exclusive events independent? Give one example of mutually exclusive events.
3. Given $P(A)= 1/3$, $P(B) = 3/4$ and $P(AUB) = 11/12$, then find $P(B|A)$.
4. Is random variable a function? If so what is its domain and range.
5. Specify the domain and range of the distribution function $F(x)$ of a random variable.
6. Find the distribution of $Y = -2\log X$, if X follows $U(0,1)$.
7. Define hazard function in reliability theory.
8. What do you mean by probable error?
9. Define partial correlation coefficients.
10. For the regression lines $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$ the variance of x is 12; find the variance of y. 										(1 x 10 = 10)

PART B

Each question carries 3 marks. Maximum marks from this part is 15

11. Give the axiomatic definition of probability. Use the axioms of probability to show that $P(AB^c) = P(A) - P(B)$.
12. Three balls are chosen at random from a box containing 6 black, 5 white and 4 red balls. Find the probability of the event that at least one ball is white.
13. Find the value of k if $f(x) = kx(1 - x)$ when $0 < x < 1$ and 0 elsewhere is a pdf of a continuous random variable.
14. The p.d.f. of a r.v. X is given by $f(x) = (1/\sqrt{2\pi})e^{-(x^2/2)}$ for $-\infty < x < \infty$ Find the p.d.f. of $Y = |X|$.
15. Two random variables have the joint p.d.f. $f(x, y) = x+y$; $0 < x < y < 1$. Examine whether X, Y are independent.
16. If $4y - 5x = 15$ is the regression line of Y on X and the coefficient of correlation between X and Y is 0.75. What is the value of the regression coefficient of X on Y?
17. How will you compute rank correlation?

PART C

Each question carries 5 marks. Maximum marks from this part is 20

18. Define sigma field of events. If S = {1, 2, 3, 4, 5} and A = {3, 5} write down the sigma field generated by A.

19. Four numbers are chosen at random without replacement from the first 20 natural numbers. What is the probability that the minimum of the chosen numbers is 7 and the maximum is 14?

20. The distribution function of a random variable is given by, $F(x) = 0$ if $x < -2$, $1/16$ if $-2 \leq x < 1$, $7/16$ if $1 \leq x < 2$, $9/16$ if $2 \leq x < 5$, $12/16$ if $5 \leq x < 8$, $13/16$ if $8 \leq x < 9$ and 1 if $x \geq 9$. Examine whether X is continuous or discrete. Obtain the pdf of X?

21. Let the joint pdf of (X,Y) be $f(x; y) = (x+y)/21$; $x = 1, 2, 3$; $y = 1, 2$ find the marginal pdfs of X and Y.

22. The joint pdf of a pair of random variables (X,Y) is given by $f(x,y)=(x+2y)/18$, $(x,y)=(1,1), (1,2), (2,1), (2,2)$. Obtain the probability distribution of $U=X+Y$.

23. Derive the angle between two regression lines.

PART D

Each question carries 10 marks. Maximum marks from this part is 30

24. In a factory, machines A and B are producing springs of the same type. Of this production, machines A and B produce 5% and 10% defective springs respectively. Machines A and B produce 40% and 20% of the total output of the factory. One spring is selected at random and it is found to be defective. What is the probability that the defective spring is produced by machine A?

25. If $f(x,y)=cx(1-y)$ for $0<x<y<1$ and 0 elsewhere is the joint pdf of a pair of random variables obtain the value of c. Examine whether X and Y are independent? Also obtain the conditional distribution of Y given X.

26. Examine the effect of change of origin and scale on Karl Pearson's coefficient of correlation.

27. Assuming linear relationship estimate the value of Z when X=37 and Y=40 using the following Data:

X:	21	24	32	35	39	46	53	55
Y:	16	14	11	12	15	14	12	12
Z:	50	58	61	62	42	41	58	62

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