LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **STATISTICS**

SECOND SEMESTER – **APRIL 2012**

# ST 2502/ST 2501/ST 2500 - STATISTICAL MATHEMATICS - I

 Date : 16-04-2012 Dept. No. Max. : 100 Marks

 Time : 9:00 - 12:00

**PART – A**

**Answer ALL the Questions: (10 x 2 = 20 marks)**

1. Define monotonically decreasing sequences.

2. Define random variable.

3. Define divergence sequences.

4. What is meant by linear dependence?

5**. Find the trace of the matrix A =**

6. State Rolle’s Theorem.

7. The probability distribution of a random variable X is: Determine       the constant k.

8. Define symmetric matrix. Give an example.

9. Find the determinant of the matrix

10. Define stochastic matrix.

**PART - B**

**Answer any FIVE questions: (5 x 8 = 40 marks)**

11. The diameter, say X, of an electric cable, is assumed to be continuous random variable with p.d.f

 i) Check that the above is a p.d.f. ; ii) Obtain an expression for the c.d.f of x ;

 iii) Compute ; iv) Determine the number K such that P(X < k) = P(X > k)

12. Prove that a convergent sequence is also bounded.

13. By using first principles, show that the sequences , where, n = 1, 2, . . . ,

 converges to .

14. Show that differentiability of a function at a point implies continuity. What can you say about the

 converse? Justify your answer.

15. State and prove Lagrange’s Mean Value Theorem. (P.T.O.)

16. Obtain the Maclaurin’s Series expansion for log(1+x), for – 1 < x < 1 .

17. If the joint distribution function of X and Y is given by

 a) Find the marginal densities of X and of Y ; b) Are X and Y independent?

 c) Find P(X 1 Y ;

18. Find inverse of the matrix

**PART - C**

**Answer any TWO questions: (2 x 20 = 40 marks)**

19. Examine the validity of the hypothesis and the conclusion of Rolle’s theorem for the          function f defined in in each of the following cases:

i) , a = 0, b = 2

ii) , a = -3, b = 0

20. Two fair dice are thrown. Let X1 be the score on the first die and X2 the score on the second die.        Let Y denote the maximum of X1 and X2 i.e. max(X1, X2).

      a) Write down the joint distribution of Y and X1.

     b) Find E (Y), Var (y) and Cov (Y, X1).

21. Suppose that two-dimensional continuous random variable (X, Y) has joint probability density        function given by

 i) Verify that

 ii) Find P (0 < X <, P(X+Y < 1), P(X > Y), P(X < 1 | Y < 2)

 22. (a) Find the rank of .

 (b) Verify whether the vectors (2, 5, 3), (1, 1, 1) and (4,–2, 0) are linearly independent. (10 +10)

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