



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

SECOND SEMESTER – APRIL 2017

ST 2502- STATISTICAL MATHEMATICS - I

Date: 04-05-2017
01:00-04:00

Dept. No.

Max. : 100 Marks

Part A

Answer ALL questions

(10 x 2 = 20 Marks)

1. Define random variable.
2. Write any two properties of distribution function.
3. Define absolute convergence of a series.
4. Name the test used for convergence of a series
5. Give the Taylor's series expansion.
6. How will you find mode for continuous distribution.
7. Define linear dependence and linear independence.
8. Give the formula for conditional distribution.
9. Define symmetric matrix.
10. Define trace of a matrix

Part B

Answer any FIVE questions

(5 X 8 = 40 Marks)

11. If $\sum_{n=1}^{\infty} a_n$ is a convergent series, then show that $\lim_{n \rightarrow \infty} a_n = 0$
12. Explain Ratio test and root test.
13. Find a suitable point c of Mean value theorem for $f(x) = x^3 + 2x^2 - x$ on $[-1, 2]$.
14. Find the Maclaurin series of the function $f(x) = e^x$.
15. Check whether the vectors $V_1 = \{1, 1, 1\}$, $V_2 = \{1, 2, 0\}$ and $V_3 = \{0, -1, 1\}$ are linearly independent.
16. Find the constant k , if $f(x) = kx^2(1-x^3)$, $0 \leq x \leq 1$. Also find its mean.

17. Find the determinant of $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$

18. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 4 & 6 & 2 \\ 1 & 2 & 3 & 2 \end{bmatrix}$

Part C

Answer any TWO questions (2 X 20 = 40 Marks)

19. A) If a sequence of real numbers $\{s_n\}_{n=1}^{\infty}$ is convergent to L, show that the limit is unique.

B) A non-decreasing sequence which is bounded above is convergent.

20. A) State and prove Rolle's theorem

B) State and prove Mean value theorem.

21. A) Find the marginal density of the random variable X and Y given the joint distribution of X and Y

as $f(x, y) = 4xy(e^{-(x^2+y^2)}); x \geq 0, y \geq 0$.

B) If two random variables X and Y have the following joint probability density function:

$$f(x, y) = \begin{cases} 2; & 0 < x < 1; 0 < y < x \\ 0; & \text{otherwise} \end{cases}$$

find the Conditional Distribution of X given Y and Y given X.

22. A) Find the rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 5 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$

B) Find the inverse of the matrix $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$
