K23U 2383

Reg. No. : ....

Name : ....

V Semester B.Sc. Degree (C.B.C.S.S.-O.B.E.-Regular/Supplementary/ Improvement) Examination, November 2023
(2019 – 2021 Admissions)
CORE COURSE IN STATISTICS
5B06 STA : Mathematical Methods for Statistics – I

Time : 3 Hours   Max. Marks : 48

Instruction : *Scientific calculator can be* ***permitted****.*

PART – A

Answer **all** questions. **Each** carries **1** mark. **(6×1=6)**

1. State whether the sequence $\{(-1)^n\}$ convergent or divergent.
2. Find lim sup of the sequence $a_n = (-1)^n\left(1+\frac{1}{n}\right)$.
3. State Cauchy's root test for series.
4. Examine the convergence of $\sum_{n=1}^{\infty}\frac{1}{n^3}$.
5. State Legrange's mean value theorem.
6. Define uniformly continuous function on an interval [a, b].

PART – B

Answer **any seven** questions. **Each** carries **2** marks. **(7×2=14)**

7. Show that every convergence sequence is Cauchy.
8. Define monotonic increasing sequence. Give an example.

P.T.O.

9. Examine the behaviour of the following sequences.

   a) $a_n = 1 + (-1)^n$

   b) $a_n = e^{\frac{1}{n}}$.

10. Give an example of a bounded and unbounded sequences.

11. Investigate the convergence of $\sum \sin\left(\frac{1}{n}\right)$.

12. Examine the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{n!}$.

13. Show that absolutely convergent series is convergent.

14. Show that $f(x) = \frac{1}{x}$ is not uniformly continuous on (0,1).

15. Prove or Disprove f(x) = |x| is differentiable at 0.

PART – C

Answer **any four** questions. **Each** carries **4** marks. **(4×4=16)**

16. Define limit point of a sequence. Find the limit point of the sequence $a_n = 1 + (-1)^n$. Is it convergent ?

17. If $\sum a_n$ converges, show that $\lim_{n\to\infty} a_n = 0$.

18. Test convergence of the following series :

    a) $\sum_{n=1}^{\infty} \frac{1}{n^4 + 1}$

    b) $\sum_{n=1}^{\infty} \frac{1}{e^n}$.

19. State and prove ratio test for series.

20. What are the different types of discontinuity ? Give examples.

21. Obtain Maclaurin series expansion of f(x) = sin(x).

PART – D

Answer **any two** questions. **Each** carries **6** marks. **(2×6=12)**

22. State and prove Bolzano Weierstrass theorem for sequences.

23. a) Define alternating series.

    b) Define Absolute convergence and conditional convergence of a series. Also examine whether the series $1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}...$ is conditionally convergent.

24. Show that if a function f is continuous on a closed interval [a, b], then it attains its bounded at least once in [a, b].

25. State and prove Rolle's Theorem. Examine whether Rolle's theorem satisfied for the function $f(x) = x^2 - 6x + 8$ on [2, 4].