K22U 2338

Reg. No. : ....

Name : ....

V Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, November 2022
(2019 Admission Onwards)
Core Course in Statistics
5B06 STA : MATHEMATICAL METHODS FOR STATISTICS – I

Time : 3 Hours Max. Marks : 48

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

PART – A

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

1. Define Bounded Sequence.
2. State D'Alembert's ratio test for series.
3. Define uniform continuity of a function in an interval.
4. State Cauchy's mean value theorem.
5. Evaluate $\lim_{x\to 0} \frac{|x|}{x}$.
6. State Daurboux's theorem in differentiation.

PART – B

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

7. Show that every convergent sequence is bounded.
8. If a function f is continuous on closed interval [a, b], show that f attains its bonds at least once in [a, b].
9. Show that the series $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges.
10. Show that the series $\frac{1}{(\log 2)^p} + \frac{1}{(\log 3)^p} + \frac{1}{(\log 4)^p} + \ldots + \frac{1}{(\log n)^p} + \ldots$ diverges for p > 0.

P.T.O.

11. Show that the function defined by $f(x) = \begin{cases} x\sin\frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ is continuous at x = 0.
12. Show that f(x) = |x| is not differentiable at origin.
13. Check whether $f(x) = \frac{x-|x|}{x}$ is continuous.
14. Establish every monotonic sequence bounded above converges.
15. Prove that a necessary condition for convergence of infinite series $\sum u_n$ is $\lim_{n\to\infty} u_n = 0$.

PART – C

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

16. 1) Given an example for bounded sequence and unbounded sequence.
    2) Prove that every unbounded sequence with unique limit point is convergent.
17. 1) State Bolzano Weierstrass theorem for sets.
    2) Prove that a sequence cannot converge to more than one point limit.
18. Show that every absolutely convergent series is convergent.
19. Examine whether Rolle's theorem is satisfied or not for $f(x) = x^3 - 4x$ on [– 2, 2].
20. 1) Show that the series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \ldots$ is convergent.
    2) Test the convergence of $\sum \frac{n^2-1}{n^2+1} x^n$
21. Investigate the convergence of Geometric Series.

PART – D

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

22. State and prove Bolzano Weierstrass theorem for sequences.
23. Define Alternating Series. State and prove Leibnitz test for convergence of series.
24. If f is continuous on [a, b], then show that f is bounded in [a, b] and f attains its supreme of least once in [a, b].
25. 1) State and prove Taylor's theorem.
    2) Find the Taylor series expansion of cos x at x = 0.