M 9825

Reg. No. : ....

Name : ....

V Semester B.Sc. Degree (CCSS – Reg./Supple./Imp.) Examination, November 2015
CORE COURSE IN STATISTICS
5B05 STA : Mathematical Analysis – I

Time : 3 Hours | Max. Weightage : 30

PART – A

Answer **any 10** questions. **(1 each)**

1. Give example (one each) for a) Monotonic increasing sequence b) Oscillating sequence.
2. Define limit of a sequence (a_n).
3. If (a_n) converge to a limit l, show that $(|a_n|)$ converge to $|l|$.
4. What is meant by sequence of partial sums of a series $\sum a_n$? How will you connect convergence of a series and convergence of its sequence of partial sums ?
5. Show that if $\sum a_n$ converges, $\lim\limits_{n\to\infty} a_n = 0$. Is the converse true ?
6. Define conditional convergence of a series.
7. State Raabe's test for convergence of a series.
8. Define limit of a function.
9. When will you say that a function has removable discontinuity at a point ?
10. Define left hand derivative of a function f at a point C.
11. State Roll's theorem. **(10×1=10)**

P.T.O.

PART – B

Answer **any 6** questions. **(2 each)**

12. Show that a sequence cannot converge to more than one limit.

13. Establish : Every monotonic sequence bounded above converges.

14. Examine the convergence of (a_n) where

a) $a_n = \left(1+\frac{1}{n}\right)^n$ b) $a_n = \frac{1}{n!}$, $n \in N$

15. If $\sum a_n$ converges, $\sum b_n$ converges, show that $\sum a_n b_n$ converges.

16. State and prove Cauchy's root test.

17. Examine convergence of the series a) $\sum \frac{1}{n}$ b) $\sum \frac{1}{n^2}$, $n \in N$.

18. Show that a function which is differentiable at a point is necessarily continuous at that point. Is the converse true ? Justify your answer.

19. Obtain Maclaurin's expansion of Sin x.

20. State and prove Lagrange's mean value theorem of differential calculus. **(6×2=12)**

PART – C

Answer **any 2** questions. **(4 each)**

21. State and prove Cauchy's general principle of convergence of a sequence of real numbers.

22. a) Examine convergence of the series : $\frac{1}{1\times2\times3}+\frac{3}{2\times3\times4}+\frac{5}{3\times4\times5}+...$

b) Define absolute convergence of a series. Show that every absolutely convergent series is convergent.

23. State and prove Lagrange's mean value theorem.

24. State Taylor's theorem. Using the theorem, prove that $e^x = 1+\frac{x}{1!}+\frac{x^2}{2!}+..., x \in R$.

(2×4=8)

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