



K23U 2366

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 MATHEMATICS
5B06 MAT : Real Analysis – I

Time : 3 Hours

Max. Marks : 48

PART – A

Answer **any 4** questions. They carry **1 mark each**.

(4×1=4)

1. State Triangle Inequality.
2. Find $\lim \left(1 + \frac{1}{2n}\right)^n$.
3. Define m-tail of a sequence.
4. Define continuity of a function at a point.
5. Define Rearrangement of the series.

PART – B

Answer **any 8** questions from among questions **6 to 16**. These questions carry **2 marks each**.

(8×2=16)

6. Determine the set A of $x \in \mathbb{R}$ such that $|2x + 3| < 8$.
7. If $a \in \mathbb{R}$ and $a \neq 0$ then show that $a^2 > 0$.
8. Discuss the convergence of $\lim \left(\frac{n}{2^n}\right)$.
9. Find the limit of the sequence whose terms are given by $x_1 = 8, x_{n+1} = \frac{x_n}{2} + 2$ for $n \in \mathbb{N}$.
10. State Monotone Convergence Theorem.
11. Define subsequence of a sequence with an example.
12. State Alternating Series test.

P.T.O.



13. Define convergent Series.
14. If $\sum a_n$ with $a_n > 0$ is convergent, then is $\sum \sqrt{a_n}$ always convergent. Justify.
15. Show that $f(x) = \frac{1}{x}$ defined on $A = (0, \infty)$ is unbounded on A .
16. State Boundedness Theorem.

PART – C

Answer **any 4** questions from among questions **17 to 23**. These questions carry **4 marks each**. **(4×4=16)**

17. Show that cosine function is continuous on \mathbb{R} .
18. Discuss the convergence of $\sum_{n=0}^{\infty} r^n$, $r \in \mathbb{R}$, $|r| < 1$.
19. Discuss the convergence of $\sum_{n=1}^{\infty} \frac{n}{n^2 + 1}$.
20. Discuss the convergence of the sequences
- $((-1)^n)$ and
 - (n) .
21. Show that Cauchy sequence of real numbers is bounded.
22. State and prove Archimedean property.
23. If a and b are positive real numbers, $a \neq b$ then show that $\sqrt{ab} \leq \frac{(a+b)}{2}$.

PART – D

Answer **any 2** questions from among questions **24 to 27**. These questions carry **6 marks each**. **(2×6=12)**

24. State and prove density theorem of rational numbers in \mathbb{R} .
25. State and prove Squeeze theorem for sequences. Hence find $\lim \left(\frac{\sin n}{n} \right)$.
26. Discuss the convergence of
- $\sum_{n=0}^{\infty} \frac{1}{(n+1)(n+2)}$
 - $\sum_{n=1}^{\infty} \frac{(\cos n)}{n^2}$.
27. Discuss the continuity of
- Dirichlet's function
 - Thomae's function.