Avinashilingam Institute for Home Science and Higher Education for Women
Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment Test I – August 2025

Semester III

Class	**: II UG**	**Time**	**: 2 Hours**
Major	**: Mathematics**	**Max. Marks**	**: 60**

23BMAC05 - Real Analysis

Course Outcomes:

CO1: Understand many properties of the real line R and learn to define sequence in terms of functions from R to a subset of R .

CO2: Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior and the limit of a bounded sequence.

CO3: Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.

CO4: Learn some of the properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.

PART A **6 x 1 = 10**

Choose the Correct Answer

1. The smallest positive real number is ------- CO1K1

a) ∞ b) 0 c) 1 d) doesn't exist

2. Determine the set A of $x \in R$ such that $|2x+3|<7$. CO1K2

a) $\{x \in R / -5 < x < 2\}$ b) $\{x \in R / 2 < x < 3\}$

c) $\{x \in R / -7 < x < 7\}$ d) $\{x \in R / -5 > x > 2\}$

3. If a $\in$ R is such that $0 \le a < \in$ for every $\in > 0$, then a = CO1K2

a) 0 b) 1 c) 2 d) n

4. $\lim\left(\sqrt{n+1}-\sqrt{n}\right)=$ CO2K2

a) 0 b) $\sqrt{n}$ c) $\sqrt{n+1}$ d) doesn't exist

5. If the sequences X and Y are converging, then which of the following is true? CO2K2

a) X+Y converges b) X-Y converges

c) X.Y converges d) all the above

6. The sequence (n) is CO2K1

a) Convergent b) divergent c) converges to 0 d) converges to n

Part B **3 x 6 = 18**

Answer ALL questions

7. a. Prove that if $u, b \neq 0 \in R$ with $u.b = b$, then $u = 1$. CO1K3

(OR)

7.b. State and prove the triangle inequality for real numbers. CO1K3

8. a. State and prove the Archimedean property of real numbers. CO1K3

(OR)

8. b. Prove that a sequence in R can have at most one limit. CO2K4

9. a. Prove that the convergence sequence of real numbers is bounded. CO2K4

(OR)

9.b. State and prove Bolzano-Weierstrass theorem. CO2K4

Part C **3 x 12 = 36**

Answer ALL questions

10. a. Prove that there does not exist a rational number r such that $r^2 = 2$. CO1K4

(OR)

10.b. State and prove the nested intervals property. CO1K3

11. a. State and prove the density theorem for rational numbers. CO1K3

(OR)

11.b. State and prove squeeze theorem. CO2K4

12. a. State and prove Cauchy's convergence criterion. CO2K4

(OR)

12.b. Prove that the sequence $\sum_{i=1}^{n} \frac{1}{i}$ diverges. CO2K4

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