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
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 II – October 2024
Semester V

Class : III UG **Time : 2 Hours**
Branch : Mathematics & Spl Edn.& Mathematics **Max. Marks : 60**

21BMAC14/21BSMC14 – Real Analysis-I

Course Outcomes:
CO1: Recognize the basic properties of Real Number System.
CO2: Identify closed and open sets in Euclidean Space.
CO3: Prove standard theorems in Real Analysis.
CO4:Understand the concept of compactness and metric spaces.
CO5:Acquire abstract and logical thinking that pervades modern analysis

Part A **6 x 1 = 6**

Choose the Correct Answer

1.A set S in R^n is said to be ----------if and only if every open covering as a finite sub cover. CO3K1

a. open covering b. compact c. closed d. bounded

2. If S is contained in M, a point a is in M is called ----------of S if some ball $B_M(a;r)$ is contained in S. CO3K1

a. interior point b. accumulation point c. base point d. None of these

3. The boundary of S, ∂S =----------. CO4K2

a. M b. $S \cap \bar{S}$ c. $\bar{S} \cap \overline{M-S}$ d. None of these

4. Every convergent sequence is a ---------- CO3K1

a. Cauchy s sequence b. increasing sequence
c. divergent sequence d. None

5. In R^1, {1/n} ---------- to 0 as $n \to \infty$ in (0,1]. CO4K2

a. converges b. does not converge
c. bounded d. None

6. Every Euclidean subspace (0,1] is ---------- CO3K1

a. closed b. complete c. not complete d. None

Part B **3 x 6 = 18**

Answer ALL questions

7. a. State and prove Lindleof covering Theorem . CO3K3

(or)

7. b. Assume that G={A_1,A_2,……} denote the countable collection of n-balls having rational radii and centers at points with rational co-ordinates. Assume x belongs to R^n and let S be and open set in R^n which contains X.Then prove that atleast one of the n-balls in G contains X and is contained in S. CO3K4

8. a. Assume that (S,d) as a metric subspace of (M,d) and let Y be a subset of S.Then prove that Y is closed in S iff Y= B∩S for some set B which is closed in M . CO4K4

(or)

8. b. Let X be a closed subset of a compact metric space M then prove that X is compact. CO4K3

9. a. Prove that in any metric space (S, d) every compact subset T is complete. CO4K3

(or)

9. b. Let p is an accumulation point of A and assume b belongs to T then $\lim_{x \to p} f(x) = b$ iff $\lim_{x \to \infty} f(x_n) = b$, b∈T for every sequence {x_n} of points A-{p} which converges to p. Prove the statement. CO3K4

Part C **3 x 12 = 36**

Answer ALL questions

10. a. Let S be a subset of R^n the following statements are equivalent:
a) S is compact
b) S is closed and bounded
c) Every infinite subset of S has an accumulation point in S. CO3K3

(or)

10. b. State and prove Heine - Borel covering theorem. CO3K3

11. a. Prove the following statement. Let (S,d) be a metric subspace of (M,d), and let X be a subset of S. Then X is open in S iff X= A ∩ S for some set A which is open in M. CO4K4

(or)

11.b. i) S.T a sequence $\{x_n\}$S in a Metric Space (S,d) can converge to atmost one point in S. CO4K4

ii) Prove the following statement. Let f: S→T be a function from (S,d_s) to another (T,d_T) and assume pϵS,then f is continuous at p,iff for every sequence $\{x_n\}$ in S converent to p, the sequence $\{f(x_n)\}$ in T converges to f(p) CO4K4

12. a. Prove that in Euclidean space R^k every Cauchy sequence is convergent . CO3K4

(or)

12. b. State and prove continuity of composite function. CO5K4

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