Avinashilingam Institute for Home Science and Higher Education for Women
Deemed to be UniversityEstd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with 'A++' Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment Test- I, February 2025
Semester - IV

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

23MMAC21 Topology - II

Course Outcomes:

CO1: Categorize the separation axioms.
CO2: Appreciate the relation between metric spaces and topological spaces.
CO3: Prove standard theorems in topology.
CO4: Demonstrate the concept of complete metric space.
CO5: Categorizethe notion of convergent in topological spaces.

Part-A **6x1=6**
Choose the correct answer

1. A subset A of a topological space X is dense in X if CO1K1
   a. cl(X) =A b. cl(A)=X c.int(A)=X d. int(X)=A
2. A space for which every open covering contains a countable subcovering is called a ---- space CO1K2
   a.Lindelof b. regular c.Hausdorff d. normal
3. Which of the following statement is wrong? CO1K1
   a. A closed subspace of a normal space is normal
   b. Every ordered topology is regular
   c.Every regular Lindelof space is normal
   d. Every normal space is Lindelof
4. T_3 axiom is known as ----- space CO2K2
   a.regular b. normal c.Hausdorff d.completely regular
5. Tietze extension theorem implies CO2K2
   a.Uniform continuity theorem b. Urysohnmetrization theorem
   c.Imbedding theorem d. Urysohn lemma
6. An arbitrary product of compact spaces is compact in the ------ topology CO3K2
   a.product b.box c. discrete d.metric

Part - B 3x6=18

Answer any two questions

Each answer should not exceed 400 words or two pages

7. a. Prove that a subspace of a first-countable space is first-countable. CO1K3

(or)

7. b. Prove that a product of Hausdorff spaces is Hausdorff. CO1K3

8. a. Show that every metrizable space is normal. CO1K4

(or)

8. b. Explain completely regular space, regular space and normal space. CO2K3

9. a. State and prove Imbedding theorem. CO2K4

(or)

9. b. Let X be a set and $\mathfrak{D}$ be a collection of subsets of X that is maximal with respect to the finite intersection property. Then prove that any finite intersection of elements of $\mathfrak{D}$ is an element of $\mathfrak{D}$ CO3K3

Part - C 3 x12 =36

Answer any one question

Each answer should not exceed 800 words or four pages

10. a. Prove that every well-ordered set X is normal in the order topology. CO1K4

(or)

10. b. Prove that X is regular if and only if given a point x of X and a neighbourhood U of x, there is a neighbourhood V of x such that $\bar{V} \subset U$, where X is a topological space in which one point sets are closed. CO1K4

11. a State and prove Uryshon lemma. CO1K5

(or)

11. b. State and prove Tietze extension theorem. CO2K5

12. a. State and prove Uryshonmetrization theorem. CO2K4

(or)

12. b. (i) State Tychonoff theorem and finite intersection property CO3K4
(ii) Let X be a space and $\mathfrak{D}$ be a collection of subsets of X that is maximal with respectto the finite intersection property. Let $D \in \mathfrak{D}$. Then show that if $A \supset D$, then $A \in \mathfrak{D}$.

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