Name: **Enrolment No:**	UPES

UPES

END Semester Examination, May 2025

Programme Name : M.Sc. (Mathematics) **Semester : II**
Course Name : Topology **Time : 03 hrs**
Course Code : MATH7023 **Max. Marks: 100**
Nos. of page(s) : 02

Instructions: All questions are compulsory. There is an internal choice in Q9 and Q11.

SECTION A
(4 Marks * 5 = 20 Marks)
Answer all questions

S. No.		Marks	CO
Q 1	What is a complete metric space? Identify whether indiscrete metric space is complete or not?	**4**	**CO1**
Q 2	Let (X, T) be a topological space with respect to the discrete topology, where $X = \{1,2,3\}$. Find the derived set of $A = \{1,2\}$, where $A \subseteq X$.	**4**	**CO2**
Q 3	Which of the spaces given below are connected? (i) $X = \{a, b, c\}$; $T = \{\Phi, \{a\}, \{b\}, \{a, b\}, X\}$ (ii) $X = \{a, b, c\}$; $T = \{\Phi, \{a\}, \{b, c\}, X\}$	**4**	**CO3**
Q 4	Prove that every T_2-space is a T_1-space.	**4**	**CO4**
Q 5	List all the topologies for $X = \{a, b, c, d\}$ which consists of exactly five members.	**4**	**CO2**

SECTION B
(10 Marks * 4 = 40 Marks)
Answer all questions. There is an internal choice in Q9.

S. No.		Marks	CO
Q 6	Define T_0, T_1, T_2, regular and normal spaces with supportive examples. Also give an example which is T_1 space but not T_2.	**10**	**CO4**
Q 7	Show that a finite topological space is T_1 -space iff it is discrete.	**10**	**CO3**
Q8	Prove that (l_1, d) is a metric space. Where l_1 has its usual meaning.	**10**	**CO1**

Q 9	Show that every limit point of a set is always an adherent point but converse may not be true. **OR** Let $X = N$, here N denotes set of natural numbers and let T be the family consisting of Φ, X and all subsets of the form $G_{n=}\{n, n+1, n+2, ...\}$. (i) Show that T is a topology on X. (ii) What is derived set of $\{1\}$?	**10**	**CO2**
SECTION C **(20 Marks * 2 = 40 Marks)** **Answer all questions. There is an internal choice in Q11.**			
Q 10	Let (X, T) and (Y, T') be topological spaces. A mapping $f: X \to Y$ is continuous iff inverse image of every open set in Y is an open set in X.	**20**	**CO3**
Q 11	Show that every convergent sequence in a Hausdorff space has a unique limit **OR** Show that a regular space is T_1 if and only if it is T_2.	**20**	**CO4**