Name **26P203**

Reg. No ....

M. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2026

SEMESTER 2 : MATHEMATICS

COURSE : **24P2MATT06 : BASIC TOPOLOGY**

(For Regular 2025 Admission and Improvement/Supplementary 2024 Admission)

Time : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	Define (i) T_1 space (ii) Normal Space.	(U)
2.	Define hereditary in a topological space. Is second countability a hereditary property?	(U)
3.	Define a component. Show that components are closed sets.	(U)
4.	Define (i) T_2 space (ii) Completely regular Space.	(R)
5.	Distinguish between continuous map and open map in topological space.	(U)
6.	Is arbitrary intersection of open sets open? Justify.	(R)
7.	Write an example of a divisible property in a topological space.	(R)
8.	Prove that compactness is preserved under continuous functions.	(U)
9.	Let $\mathscr{T}_1$ and $\mathscr{T}_2$ be two topologies for a set having bases $\mathscr{B}_1$ and $\mathscr{B}_2$ respectively, the $\mathscr{T}_1$ is coaser than $\mathscr{T}_2$ if and only if every member of $\mathscr{B}_1$ can be expressed as a union of some members of $\mathscr{B}_2$.	(R)
10.	Prove or disprove : connectedness is preserved under continuous functions.	(R)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	For any subset A of X, show that $Cl(A) = \{y \in X$, every neighborhood of y meets A non vacuously $\}$.	(U)
12.	Prove that T_2 implies T_1, but, the converse is not true.	(U)
13.	Prove that every open subset of real line (in the usual topology) can be expressed as the unioin of mutually disjoint open intervals.	(U)
14.	Prove that every compact Hausdorff space is T_3.	(R)
15.	Show that closure of a connected space is connected. Is the converse true. Justify your answer.	(U)
16.	Prove that every second countable space is first countable but not conversely.	(U)
17.	Prove that every second countable space is separable.	(R)
18.	Define neighbourhood and show that a subset of a topological space is open if and only if it is a neighbourhood of each of its points.	(U)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19. (a) Let $X_1 \dots X_n$ be topological spaces and X their topological product. Suppose X_i is locally connected at a point x_i for $i = 1 \dots n$. Let $x = (x_1 \dots x_n) \in X$. Prove that X is locally connected at x. (U)
(b) Prove that an open subspace of a locally connected space is locally connected.

20. Define Tychnoff space and show that every Tychnoff space is T_3. (U)

21. (a)Let X be a set, $\mathscr{T}$ a toplogy on X and S a family of subsets of X. Show that S is a subbase for $\mathscr{T}$ if and only if S generates $\mathscr{T}$.
(b) If $(X, \mathscr{T})$ is second countable and $Y \subset X$, then show that any cover of Y by members of $\mathscr{T}$ has a countable subcover. (U)

22. Prove that a function $e : X \to Y$ is an embedding if and only if it is continuous , one-one and for every open set V in X there exists an open subset W of Y such that $e(V) = W \cap e(X)$. (U)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;