Reg. No.: | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

PG DEGREE END SEMESTER EXAMINATIONS - NOVEMBER 2024.

(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: M.Sc., MATHEMATICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
III	PART - III	CORE - 9	P23MA309	TOPOLOGY

Date : 11.11.2024/ FN **Time : 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	If A is closed in Y and Y is closed in X then A is ________________. a) closed in X b) closed in Y c) open in X d) open in Y
CO1	K2	2.	Every order topology is ______________. a) complete space b) compact space c) connected space d) Hausdorff space
CO2	K1	3.	A function $f: X \to Y$ is continuous, __________________. a) if for every open subset of V of Y, the set $f^{-1}(V)$ is an open subset of X b) if for every closed subset of V of Y, the set $f^{-1}(V)$ is an open subset of X c) if for every open subset of V of X, the set $f^{-1}(V)$ is an open subset of Y d) if for every closed subset of V of X, the set $f^{-1}(V)$is an closed subset of Y
CO2	K2	4.	A function $f: X \to Y$ is continuous then. a) for every subset A of Y, the set $f^{-1}(A)$ is closed in Y b) for every subset A of Y, the set $f^{-1}(A)$ is open in Y c) for every subset A of Y, the set $f^{-1}(A)$ is closed in X d) for every subset A of Y, the set $f^{-1}(A)$ is open in X
CO3	K1	5.	A connected space need not be __________. a) connected b) path connected c) components d) path components
CO3	K2	6.	A space X is _________ if and only if for every open set U of X, each path component of U is open in X. a) path connected b) path components c) locally connected d) locally path connected
CO4	K1	7.	A space X is said to be ___________ if every infinite subset of X has a limit point. a) compact b) connected c) limit point compact d) path connected
CO4	K2	8.	The one-point compactification of the real line $\Re$ is ___________ with the circle. a) homeomorphism b) isomorphism c) compact d) connected
CO5	K1	9.	Every metrizable Lindelof space has a _____ set. a) countable b) uncountable c) dense d) countable dense
CO5	K2	10.	Every metrizable space is ________. a) compact b) connected c) normal d) none

Course Outcome	Bloom's K-level	Q. No.	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K2	11a.	Let X be a set and $\mathscr{B}$ be a basis for a topology τ on X. Then prove that τ is equals to the collection of all union of elements of $\mathscr{B}$.
			(OR)
CO1	K2	11b.	Let Y be a subspace of X. If U is open in Y and Y is open in X. Then prove that U is open in X.
CO2	K2	12a.	Prove that the function $f: R \to R$ given by $f(x) = 3x - 1$ is a homeomorphism.
			(OR)
CO2	K2	12b.	Prove that sequence lemma.
CO3	K3	13a.	Show that the union of a collection of connected subspaces of X that have a point in common is connected.
			(OR)
CO3	K3	13b.	A space X is locally path connected if and only if for every open set U of X, each path components of U is open in X.
CO4	K3	14a.	Show that every closed subspace of a compact space is compact.
			(OR)
CO4	K3	14b.	State and prove Lebesgue number lemma.
CO5	K4	15a.	Prove that a subspace of a Hausdorff space is Hausdorff and a product of Hausdorff spaces is Hausdorff.
			(OR)
CO5	K4	15b.	Show that every compact Hausdorff space is normal.

Course Outcome	Bloom's K-level	Q. No	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K4	16a.	If A is a subspace of X and B is a subspace of Y then prove that the product topology on $A \times B$ is the same as the topology $A \times B$ inherits as a subspace of $X \times Y$.
			(OR)
CO1	K4	16b.	If X is a Hausdorff space, then prove that a sequence of points of X converges to at most one point of X.
CO2	K5	17a.	State and prove Pasting Lemma.
			(OR)
CO2	K5	17b.	State and prove Uniform Limit Theorem.
CO3	K5	18a.	Show that a finite cartesian product of connected space is connected.
			(OR)
CO3	K5	18b.	State and prove Intermediate Value Theorem.
CO4	K5	19a.	State and prove Uniform Continuity Theorem.
			(OR)
CO4	K5	19b.	Let X be locally compact Hausdorff space. Let A be a subspace of X. If A is closed in X or open in X, then prove that A is locally compact.
CO5	K6	20a.	State and prove Urysohn Lemma.
			(OR)
CO5	K6	20b.	State and prove Tietze Extension Theorem.