Code: 23010 | M.Sc. (Mathematics) Semester–1 | Seat No. ________

Paper – 103: Topology – I

Time: 1 ½ Hours] 19 FEB 2021 [Total Marks: 42

Attempt any three questions out of four.

Q.1 Define topological space. Also discuss $\mathcal{J}$ – open and $\mathcal{J}$ – closed sets. Discuss with all details cofinite topology. [14]

OR

Q.1 (A) Define door space and give an example of door space. [7]

(B) Let F_1 and F_2 be closed subsets of a topological space X then prove that $F_1 \cup F_2$ is a closed set. [7]

Q.2 Define closure and interior of a set. If A is any subset of a topological space $(X, \mathcal{J})$. Then prove that $\bar{A}$ is the smallest closed set containing A. [14]

OR

Q.2 (A) In usual notation prove following results [7]

(i)$A \subset B \Rightarrow A^0 \subset B^0$ (ii) $(A \cap B)^0 = A^0 \cap B^0$

(B) In usual notation prove following results [7]

(i) $\overline{A \cup B} = \bar{A} \cup \bar{B}$ (ii) $\overline{A \cap B} \subseteq \bar{A} \cap \bar{B}$

Q.3 In a topological space define continuous map. Let X and Y be a topological space. Prove that a map $f: X \to Y$ is continuous iff the inverse image of every open set in Y is open in X. [14]

OR

Q.3 (A) Show that every discrete space is T_0 space. [7]

(B) Prove that discrete topological space is T_1 space. [7]

Q.4 Prove that two open subsets of a topological space are separated iff they are disjoint. [14]

OR

Q.4 (A) Prove that a continuous image of a connected space is connected. [7]

(B) Prove that each singleton set in a Hausdroff space is closed. [7]

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