**23P203** (Pages: 2) Name: ……………………

Reg. No: …………………..

**SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2024**

(CUCSS - PG)

(Regular/Supplementary/Improvement)

**CC19P MTH2 C08 – TOPOLOGY**

(Mathematics)

(2019 Admission onwards)

Time: Three Hours Maximum: 30 Weightage

## PART - A

Answer ***all*** questions. Each question carries 1 weightage.

1. Construct a non-trivial topology on the set $X = \{x : x \text{ is a prime number less than } 10\}$.
2. Write true or false. Justify.
   ‘Finite intersection of 2 or more topologies defined on any non-empty set X is again a topology.’
3. Define sub-base for a topology. Give example.
4. Define embedding of a topological space into another. Give example.
5. Prove that the property of being a discrete space is divisible.
6. Prove that every open, surjective map is a quotient map
7. Prove that compactness is preserved under a continuous map.
8. “A sequence in a Hausdorff space can have more than one limit”. True or False. Justify.

**(8 × 1 = 8 Weightage)**

## PART - B

Answer any ***two*** questions from each unit. Each question carries 2 weightage

UNIT – I

9. Define scattering topology on $R$. Does there exist a sequence that converges to an irrational number in a scattering topology?
10. Prove that if a space is second countable then every open cover of it has a countable subcover.
11. Give an example of two distinct topologies on a set which relativise to the same topology on some subset.

UNIT – II

12. Prove that every second countable space is Seperable.
13. Differentiate between the week topology and the strong topology determined by the family of functions $\{f_i : i \in I\}$.
14. Prove that the topological product of two connected spaces is connected.

UNIT – III

15. Differentiate between $T_1$ space and $T_2$ spaces with examples.
16. Prove that every continuous, one to one function from a compact space into a Hausdorff space is an embedding.
17. Prove that all $T_4$ spaces are completely regular and hence Tychonoff.

**(6 × 2 = 12 Weightage)**

## PART- C

Answer any ***two*** questions. Each question carries 5 weightage.

18. Characterize completely convergence of sequences in the co-finite topolgy.
19. 1) Every closed and bounded interval is compact.
    2) Every quotient space of a locally connected set is locally connected.
20. Prove that a connected space need not be path connected.
21. State Urysohn's lemma and establish the existence of the Urysohn's function.

**(2 × 5 = 10 Weightage)**

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