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PG CBCS
M.SC.Semester-II Examination, 2021
(MATHEMATICS)
PAPER: MTM-206
(**GENERAL TOPOLOGY**)

Full Marks: 20   **Time: 1 Hour**

Answer any <u>TWO</u> questions from the following: **2×10=20**

1. (a)Is the collection $\tau = \{U: X - U \text{ is infinite or empty or all of } X\}$ a topology on X?

    (b) If L is a straight-line in the plane, describe the topology L inherits as a subspace of $\mathbb{R}_l \times \mathbb{R}$ and as a subspace of $\mathbb{R}_l \times \mathbb{R}_l$. In each case is it a familiar topology?

    (c) Show that if X is compact Hausdorff under both τ and τ', then either τ and τ' are equal or they are not comparable.   2+4+4

2. (a) Show that every metric space is normal.
    (b) Show that the product of two regular spaces is regular.   5+5

3. (a) (i) In the finite complement topology on $\mathbb{R}$, to what point or points does the sequence $x_n = \frac{1}{n}$ converge?
    (ii) Determine the closure of the following subsets of the ordered square:
    $A = \{x \times \frac{1}{2}: 0 < x < 1\}$,
    $B = \{\frac{1}{2} \times y: 0 < y < 1\}$.
    (b) Let A be a subset of a topological space X. Then show that $x \in \bar{A}$ if and only if every open set U containing x intersects A.   (3+2)+5

4. (a) If X is a compact space and Y is a Hausdorff space then any bijective continuous function from X into Y is a homeomorphism.
    (b) If f:X→Y is a homeomorphism and p∈X then f:X-{p}→Y-{f(p)} is a homeomorphism.
    (c) By using (b) show that (0,1) is not homeomorphic to (0,1].4+3+3

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