Q1/

(A) Define "Totally disconnected space". Show that every discrete space X is a totally disconnected space.

(B) Define "Homeomorphism in topology". State and prove an equivalent statement of homeomorphism.

Q2/

(A) State and prove "Left-ray topology".

(B) Define "Subspace". Show that the subspace satisfies all conditions of topology.

Q3/

(A) Define "Sequential continuity in topology". What is the relation between continuity and sequential continuity in topology ? Prove it.

(B) Define "Base for a topology". Let X = {a, b, c} and **B** = {{a}, {c}, {a, b}, {b, c}}. Show that **B** is not a basis for any topology on X.

Q4/

(A) Define "Separated set". What is the relation between separated sets and disjoint? Under what condition the converse of above relation is true? Prove it.

(B) Write **"True"** or **"False"** of the following:

Let (X, τ) be a topological space and $A, B \subset X$.

(1) Every metric space is topological space.

(2) Every closed subset of a locally compact space is locally compact.

(3) A subset A of a space (X, τ) is called dense in itself if $A \subset Cl(A)$.

(4) Every discrete space is a locally connected space.

(5) In topological space, every convergent sequence has unique limit.

(6) X is connected iff X can be expressed as union of two disjoint non-empty closed sets.

(7) $Int(A \cup B) = Int(A) \cup Int(B)$.

(C) Define "open function". Let **B** be a base for a space X. If $f: X \to Y$ has the property that $f(B)$ is open, for every $B \in$ **B**, then show that f is an open function.