Q1/

(A) Define "Neighbourhood of a point". Show that a subset G of a space X is open **iff** it is a neighbourhood of each of it is points.

(B) Define "continuous function in topology". Let X and Y be two topological spaces. Show that a function *f*: X→Y is continuous **iff** the inverse image of every member of a sub-base of Y is open in X.

Q2/

(A) Define "Disconnected space". Let (Y, τ_Y) be a subspace of a space (X, τ) and $A \subset Y$. Show that A is τ-disconntected **iff** A is τ_Y-disconntected.

(B) Define "open function". Let (X, τ) and (Y, σ) be two topological spaces. Show that a mapping $f: X \to Y$ is open **iff** $f(\text{Int}(A)) \subset \text{Int}(f(A)), \forall A \subset X$.

Q3/

(A) Define "Locally connected space". Show that locally connectedness is a topological property.

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

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

(1) Let (X, d) be a metric space. If Y is an infinite subset of X, then the subspace Y has the discrete topology.

(2) If Y is a subspace of X. If $A \subset Y$, then Cl(A) in Y = Y $\cap$ (Cl(A) in X).

(3) In general, the number of elements of topology is equal to the number of elements of it is subspace.

(4) $A^o = A - b(A)$.

(5) D(**Q**) = **Q**, where **Q** is the set of all rational numbers and D is the derived set.

(6) Every component of a locally connected space is a closed set.

(7) A space X is said to has Bolzano-Weierstrass property if every finite subset of X has a limit point in X.

(8) The union of a family of connected subsets with nonempty intersection is connected.

Q4/

(A) Define "Base for a topology". Let (X, τ) be a topological space. Show that a subcollection **B** of τ is a base for τ **iff** every τ-open set can be expressed as a union of some members of **B**.

(B) Let τ be a topology on a set X consisting of four sets, i. e.,

$\tau = \{X, \phi, A, B\}$, where A and B are non-empty distinct proper subsets of X. What conditions must A and B satisfy to become τ a topology on X.