UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program : Fifth Semester – Fall 2021

Roll No. ……………

Paper: Topology **Course Code: MATH-305** **Time: 3 Hrs.** **Marks: 60**

Q.1. Solve the following: **(6x5=30)**

(a) Define compact space. Give one example of a compact subspace of R under usual topology.

(b) Prove that Unit circle S^1 centered at the origin with radius one is connected under subspace topology of Plane.

(c) Does the set $\{\{a\},\{b,c\},\{d\}\}$ forms a basis for a topology on set $X=\{a,b,c,d\}$, if yes then find the topology.

(d) Define derived set of a subset in topological space. Find all limit points of the set $X=\{(n,\frac{1}{n^2})\mid, n\in Z-\{0\}\}$.

(e) Define Housedrouf space and give two examples of this space. Given an example of a space in which a sequence can converge to more than one point.

(f) Prove that union of many connected spaces having non-empty intersection, is also connected.

Solve the following. **(3x10=30)**

(Q2) Define usual and Co-finite topology on $\mathbb{R}$. Find a set (if possible) which is both open and closed and a set (if possible) that is neither open nor closed in both topologies.

(Q3) Prove that continuous image of a compact set is compact. Why $(0,1]$ is non-compact.

(Q4) Let A be a subset of a topological space X. Then prove A is closed iff (the set of all limit points of A), $A'\subseteq A$.