KISII UNIVERSITY

TWIN TOWERS CAMPUS

EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN PURE MATHEMATICS

MATH 803- GENERAL TOPOLOGY I

STREAM- MSC YISI

TIME: 3 HOURS

INSTRUCTIONS: ANSWER QUESTION ONE COMPULSORY AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a) i) Define the term a T_1- space (1mk)

ii) Prove that a topological space is a T_1- space if and only if every singleton subset of X is closed (7mks)

b) Show that a finite subset of a T_1- space X has no accumulation points (6mks)

c) i) What is a regular space? (2mks)

ii) Show that every subspace of a regular space is regular (7mks)

d) i) Define a locally compact set (1mk)

ii) Prove that every compact space is locally compact (6mks)

QUESTION TWO (20 MARKS)

a) i)What is a Hausdorff space (1mk)

ii) Show that every subspace of a Hausdorff space is also a Hausdorff space (5mks)

b) i) Let X be a T_3-space. Prove that X is also a Hausdorff space (3mks)

ii) Prove that every metric space X is always a Haursdoff space (5mks)

c) Use a counter example to show that a T_0- Space is not necessarily a T_1- Space (5mks)

d) What is a lindelof space (1mk)

QUESTION THREE (20 MARKS)

a) i)What is meant by a first countable space (2mks)

ii) Show that any subspace (Y, τ_Y) of a first countable space (X, τ) is also first countable (11mks)

b) i) What is meant by a metrizable topological space? (1mk)

ii) State Urysohn's metrization theorem and Tietze extension theorem (4mks)

iii) State the finite intersection property (2mks)

QUESTION FOUR (20 MARKS)

a) i) What is a compact set (2mks)

ii) Define a second countable space (2mks)

iiI) Let $\mathcal{G}$ be a base for a second countable space X. Prove that $\mathcal{G}$ is reducible to a countable base for X (10mks)

b) Show that every subspace of a second countable space is second countable (6mks)