TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

THE DEGREE OF BACHELOR OF

AMA4408: **TOPOLOGY**

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

SERIES: September 2018

TIME: 2HOURS

DATE: Pick DateSep2018

Instructions to Candidates
You should have the following for this examination
-*Answer Booklet, examination pass and student ID*
This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

Question ONE (30 MARKS)

a) Let A be a subset of a topological space (X, τ) on X ={a, b, c} Show that the derived set A' of A is empty (5 marks)

b) Let τ be the class of subsets of $\mathbb{R}$ consisting of $\mathbb{R}, \phi$ empty set and all open infinite intervals $E_n = (a, \infty)$ with a belonging to $a \in \mathbb{R}$.Show that τ is a topology on $\mathbb{R}$ (6 marks)

c) Define the following

i) open neighbourhood (3marks)

ii) closed set (3marks)

iii) cluster point (3marks)

d) Let τ be the confinite topology on any set X. Show that

e) Define a normal space (2 marks)

Question TWO (20 MARKS)

a) Consider the topology on X = {a, b, c, d, e}

$\tau = \{X, \phi, \{a\}, \{a, b\}, \{a, c, d\}, \{a, b, c, d\}, \{a, b, e\}\}$

i) List the closed subsets of X (4 marks)

ii) Determine the closure of the set (4 marks)

{a}

{b}

{c, e}

iii) State the sets that are dense in X (2 marks)

b) State and prove Lindelof's theorem (10 marks)

Question THREE (20 MARKS)

a) Show that every subspace of a Hausdorff space is also Hausdorff (8 marks)

b) Show that every subspace of a regular space is regular (8 marks)

c) When is a topological space first countable space (2 marks)

d) State what is meant by a regular space (2 marks)

Question FOUR (20 MARKS)

a) Define the following

i) Open set (3 marks)

ii) T_1 space (3 marks)

iii) Homeomorphic space (3 marks)

iv) Derived set (3 marks)

a) Let X= {a, b, c, d, d, e}.

Determine whether or not each of the following classes of subsets of X is a topology on X

(10 marks)

$T_1 = \{X, \phi, \{a\}, \{a, b\}, \{a, c\}\}$

$T_2 = \{X, \phi, \{a, b, c\}, \{a, b, d\}, \{a, b, c, d\}\}$

$T_3 = \{X, \phi, \{a\}, \{a, b\}, \{a, c, d\}, \{a, b, c, d\}\}$

Question FIVE (20 MARKS)

b) Show that a set G is open if and only if it is a neighbourhood of each of its point (4 marks)

c) Consider the topology

$\tau = \{X, \phi, \{a\}, \{c, d\}, \{a, c, d\}, \{b, c, d, e\}\}$ on X and subset A= $\{a, d, e\}$ on X

Determine the relativisation of τ on A. (6 marks)

d) Let $f: X \to Y$ be a function from a non empty set X into a topological space (Y, U), let τ be the class of inverses of open subsets of Y:

$\tau = \{f^{-1}(G): G \in U\}$. Show that τ is a topology on X (8 marks)

e) Define a normal space (2 marks)