(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION

AND BACHELOR OF SCIENCE

COURSE CODE: MAP 421

COURSE TITLE: TOPOLOGY II

DATE: 03/08/2023 **TIME**: 8:00 AM - 10:00 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

SECTION A [30 MARKS] Compulsory

QUESTION ONE.

(a) . Define the following terms; [6 MARKS]

i. T_1-space.

ii. T_2-space.

iii. An arcwise connected space.

(b) . Let Γ be the usual topology in $\mathbb{R}$. Show that $(\mathbb{R}, \Gamma)$ is connected. [6 MARKS]

(c) . Show that every subspace of a T_1-space is a T_1-space. [6 MARKS]

(d) . If a and b are two distinct points of a Tychonoff space (X, Γ), show that there exists a real valued continuous mapping f of X such that $f(a) \neq f(b)$. [6 MARKS]

(e) . Deduce that every sequentially compact space is countably compact. [6 MARKS]

SECTION B [40 MARKS] Answer any TWO questions

QUESTION TWO.[20 Marks]

(a). Define a regular space. Prove that regularity is a topological property. [10 MARKS]

(b). Define a normal space. Show that normality is a topological property. [10 MARKS]

QUESTION 3 [20 Marks].

(a). Show that the function $f : \mathbb{R} \to \mathbb{R}^2$ defined by $f(x) = (x, 0)$ for each $x \in \mathbb{R}$ is an embedding of $\mathbb{R}$ in $\mathbb{R}^2$ [10 MARKS]

(b). Deduce that a topological space is a Tychonoff space if and only if it is embeddable into a cube. [10 MARKS]

QUESTION 4 [20 Marks].

(a). A topological space X is said to be a T_2-space or hausdorff space. Show that every compact subset E of a Hausdorff space X is closed. [10 MARKS]

(b). Prove that a paracompact space is normal. [10 MARKS]

QUESTION 5 [20 Marks]. State and prove Urysohns Metrization Theorem