

**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF MATHEMATICS AND ACTURIAL SCIENCE**

**UNIVERSITY EXAMINATION FOR DEGREE OF MASTER OF SCIENCE IN PURE MATHEMATICS**

**1st YEAR 1st SEMESTER 2016/2017 ACADEMIC YEAR**

**MAIN REGULAR**

**COURSE CODE: 805**

**COURSE TITLE: GENERAL TOPOLOGY**

**EXAM VENUE: STREAM: (Msc. Pure Mathematics)**

DATE: EXAM SESSION:

TIME:

**Instructions:**

1. **Answer any THREE questions only**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**QUESTION ONE [20 MARKS]**

(a). Let A be a topological space. Prove that a subset B of A is open in A if and only if B is a

neighbourhood of each point belonging to B. (4 marks)

(b). Show that the relative topology is indeed a topology. (4 marks)

(c). State without proofs the following: Tietze’s Extension Theorem; Urysohn’s Metrization

Theorem. (6 marks)

(d). Diﬀerentiate between a filter and a net. (2 marks)

(e). Show that the Euclidean topological space is not trivial. (4 marks)

**QUESTION TWO [20 MARKS]**

(a). Show that any constant map between two topological spaces is continuous. (6 marks)

(b). Prove that a map defined by, “is homeomorphic to” between topological spaces is an

equivalence relation. (14 marks)

**QUESTION THREE [20 MARKS]**

(a). Describe the following aspects of general topology: Uniform Continuity; Essential

Connectedness; Quasi-Compactness. (6 marks)

(b). Show that all metric spaces are Hausdorff spaces. (8 marks)

(c). Prove that T1-property is hereditary. (8 marks)

**QUESTION FOUR [20 MARKS]**

(a). Describe the second axiom of countability in topological spaces. (4 marks)

(b). Explain the meaning of identification topology, homotopy equivalence and null

homotopic map. (6 marks)

(c). Prove that the property of a space being Lindelof is topological. (10 marks)

**QUESTION FIVE [20 MARKS]**

(a). Prove that every convergent sequence in T2-space has a unique limit. (10 marks)

(b). Show that every T4-space is T3-but a normal space need not be regular. (6 marks)

(c). Describe two applications of the study of topology to real life situations giving relevant

examples. (4 marks)