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**JOMO KENYATTA UNIVERSITY**

**OF**

**AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2014/2015**

**FOURTH YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF**

**BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE**

**SMA 2401: TOPOLOGY I**

**DATE: APRIL 2015 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS**

**QUESTION ONE (30 MARKS)**

1. i) Define the meaning of a topology on a non-void set X. [3 marks]

ii) Determine whether the set T {X,, {a, b, c,}, {a, b, d}, {a, b, c, d,}}

is a topology on the set X = {a, b, c, d, e} [3 marks]

1. i) Let X = {a, b, c, d} and let S = { {a, b}, {a, c}, {b, d}}, determine the

topology Ton X generated by S. [6 marks]

ii) Let (X, T) be a topological space and (Y, TY) a subspace of (X, T).

Let A Y. Show that if A is TY-open and YT, then AT. [5 marks]

1. i) Let (X1 T) be a topological space, such that T = {X,, {a}, { c, d},

{a, c, d}, {b, c, d,}}. Find the relative topology TA on A = {a, b, d} [5 marks]

ii) Determine whether (X, T) is a T0-space, were X = [0, 1], and

T = {, {1}, X} [3 marks]

1. Using a counter - example, show that a union of topologies on a non-void

set X need not be a topology on X. [5 marks]

**QUESTION TWO (20 MARKS)**

1. Let (Y, T) be a topological space, and f: X  Y be a function on a

non-void set X into Y. Show that:

M = {f-1 (G): G T} is a topology on X

[10 marks]

1. Let X = {a, b, c, d, e}, and let T be the topology generated by the sub-basis

B = { {a}, {b, c,}, {b, c, d,}. {a, d, e}}. List the close subsets of (X, T) [10 marks]

**QUESTION THREE (20 MARKS)**

1. Show that a constant map f: X  Y is always continuous regardless

of the topologies on X and Y [12 marks]

1. Prove that if E is nowhere dense in (X, T), then every subset A of E is

also nowhere dense. [8 marks]

**QUESTION FOUR (20 MARKS)**

1. i) Define the meaning of a topological space (X, T) to be Hausdorff. [3 marks]

ii) Prove that every subspace of a Hausdorff space is Hausdorff. [7 marks]

1. Show that the relative topology TY on Y is indeed a topology on Y. [10 marks]