

W1-2-60-1-6

**JOMO KENYATTA UNIVERSITY**

**OF**

**AGRICULTURE AND TECHNOLOGY**

**University Examinations 2015/2016**

**SECOND YEAR FIRST SEMESTER EXAMINATION BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE**

**SMA 2202: ALGEBRAIC STRUCTURES**

**DATE AUGUST 2015 (2HOURS)**

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

**QUESTION ONE (30MARKS)**

1. Determine whether the rule  is operation on the set of integers (3marks)
2. Consider the operation on. Determine whether;
3. \* is commutative (2marks)
4. \* is associative (2marks)
5. is an identity element with respect to \* (3marks)
6. Every has an inverse with respect to \* (3marks)
7. Prove that x cannot have more than one inverse in a semigroup (4marks)
8. Let is the set of natural numbers. Let be the operation on S defined by Show that is a semi group

(4marks)

1. Let denote a residue system modulo 16 system consisting of integers relatively prime to 16. Work out the multiplication table for and then conclude if a group is. (6marks)
2. List all the zero divisors of (3 marks)

**QUESTION TWO (20MARKS)**

1. Proof that every cycle group is abelian. Hence or otherwise, show if the converse holds (6marks)
2. Define a ring and show that the set of integers mod 5 is both a ring and a field.

(8marks)

1. Let Let  be permutations of. Compute all the left cosets of the subgroup }

(6marks)

**QUESTION THREE (20MARKS)**

a)

i) Define the term dihedral group, (2marks)

ii) Hence or otherwise, make the Cayley table for (10marks)

b) Let be an operation defined on such that for all . Show if is associative, commutative? (5marks)

c) Consider the set of natural numbers, and let denote the operation of the least common multiples (1cm) on. Is) a semigroup? Is it commutative? (2marks)

**QUESTION FOUR (20MARKS)**

1. Consider the group under multiplication modulo 11
2. Work out the multiplication table of G (4marks)
3. Evaluate  (4 marks)
4. State without proof the langrage’s theorem (2marks)
5. Let G be a group
6. What does it mean to say that G is a group? (3marks)
7. Proof that  is a binary operation on G, then the left and right cancellation laws hold in G. (7marks)