

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**P.O. Box 972-60200 – Meru-Kenya**

**Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411**

**Fax: 064-30321**

**Website:** [**www.must.ac.ke**](http://www.must.ac.ke) **Email:** [**info@must.ac.ke**](mailto:info@must.ac.ke)

**University Examinations 2015/2016**

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF PHYSICAL SCIENCE AND BACHELOR OF COMPUTER SCIENCE AND FORENSICS

**SMA 3212: NUMBER THEORY**

**DATE: November, 2015 TIME: HOURS**

**INSTRUCTIONS:** *Answer questions* ***one Compulsory*** *and any other* ***two*** *questions*

**QUESTION ONE - (30 MARKS)**

1. Given that and a|c and that m and n are integers, show that a|(mb + nc).(3 Marks)
2. Write a in the form a = bq + r, 0 given that;
3. a = -17, b = 5 (2 Marks)
4. a = - 39 , b = - 8 (2 Marks)
5. (i) Define a linear diophantine equation. (2 Marks) (ii) State any two possible solutions of the linear Diophantine equation 2x + 3y = 2

(2 Marks)

1. Use the Euclidean algorithm to calculate the greatest common divisor of (381, - 216, 48, 918) (5 Marks)
2. If we define Nk = + 1, where Pi are prime numbers in ascending order, write down the first five Nk. (5 Marks)
3. Find the solution to 42x 50 (mod 91) (3 Marks)
4. (i) State Euler’s theorem in number theory. (2 Marks)

(ii) If n = q, verify Euler’s theorem. (4 Marks)

**QUESTION TWO (20 MARKS)**

1. (i) State the Fermat’s little theorem. (2 Marks)

(ii) Using the theorem in (i) calculate (mod 31). (8 Marks)

1. Calculate;
2. The gcd (12, 378,3054) (6 Marks)
3. the lcm (4 Marks)

**QUESTION THREE ( 20 MARKS)**

1. Define a residue class, modulo n. (3 Marks)
2. There are five, residue classes, modules. State them. (5 Marks)
3. (i) Define the Euler phi-function (2 Marks)

(ii) Determine and list them. (5 Marks)

1. Find the exponent to which 19 belongs (mod7) (5 Marks)

**QUESTION FOUR (20 MARKS)**

1. Use Euler’s method to solve the Diophantine equation 738 x+621y = 45. (10 Marks)
2. solve 42x 50 (mod 76) (5 Marks)
3. List the quadratic residues and quadratic non residues (mod17) (5 Marks)

**QUESTION FIVE (20 MARKS)**

1. Write (136,232) as a sum of multiples of 136 and 232. (6 Marks)
2. Solve 6x 15 (mod 21) (4 Marks)
3. (i) Define a primitive Pythagorean triple. (2 Marks)

(ii) Give three examples of Pythagorean triples. (3 Marks)

1. If m and n are each the sum of two squares, then prove that Mn their product, is also a sum of two squares. (5 Marks)