**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

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**University Examinations 2016/2017**

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE, BACHELOR OF SCIENCE IN STATISTICS, BACHELOR OF SCIENCE, BACHELOR OF SCIENCE IN ACTURIAL SCIENCE, BACHELOR OF EDUCATION SCIENCE, BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND FORENSICS, BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY..

**SMA 3111: DISCRETE MATHEMATICS**

**DATE: DECEMBER, 2016 TIME: 2 HOURS**

**INSTRUCTIONS: -** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Differentiate between
2. An injective and surjective function (2 marks)
3. A tautology and a contingency (2 marks)
4. Construct a truth table for the compound proposition  (4 marks)
5. Prove that if $3n+2$ is odd then $n$ is odd. (5 marks)
6. Test the validity of the following statement. If the productivity of rice increases then the price will go down, the price goes down therefore the productivity increases. (5 marks)
7. Given that $f(x)$ and $g(x) $are defined in the set of real numbers as  and  determine  (3 marks)
8. Find the distance between the point $(-2,9)$ (1 mark)
9. Prove that is irrational (5 marks)
10. Describe the set $\left\{xϵR:3<x<1\right\}$ (3 marks)

**QUESTION TWO (20 MARKS)**

1. Given the set  find
2. The order of A (1 mark)
3. The power set of A and the order of the power set of A (3 marks)
4. A survey conducted at Meru University on social media revealed that out of 550 students, 300 like whatsapp, 250 like twitter and facebook, 50 whatsapp and twitter, 100 whatsapp and facebook. Determine how many of the students like if every student likes at least one media
5. All the three (8 marks)
6. Exactly one of the three (2 marks)
7. Given the sets . Find
8.  (2 marks)
9.  (2 marks)
10. Show that  (2 marks)

**QUESTION THREE (20 MARKS)**

1. Define the following terms as used in logic
2. Logical equivalence (2 marks)
3. Valid argument (2 marks)
4. Check whether the compound proposition is a tautology  (8 marks)
5. Negate the following statements
6. There exists a computer science student in the class (2 marks)
7. $∀xϵZ,∃{yϵZ}/{x}+y=0$ (2 marks)
8. Write the converse and inverse of the statement “if i study hard then i can pass the exams” (4 marks)

**QUESTION FOUR (20 MARKS)**

1. Use mathematical induction to show that $ϵN$ (6 marks)
2. Let where  such that check whether $f$ is abijection. (4 marks)
3. Given  and , find
4.  and state the domain (5 marks)
5.  (2 marks)
6. By a suitable example, show that the product of any two prime numbers need not be odd. (3 marks)

**QUESTION FIVE (20 MARKS)**

1. Using the set notation, prove that  (5 marks)
2. Represent in a Venn diagram  (3 marks)
3. Show that the compound propositions  and are logically equivalent. (5 marks)
4. Prove that there is no integer which is both even and odd. (5 marks)
5. State the truth value of following propositions
6. $ϵZ∃yϵR:^{x}/\_{2}=y$ (1 mark)
7. $x+y=y+x ∀x,yϵZ$ (1 mark)