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**University Examinations 2015/2016**

FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF EDUCATION

**SMA 3111: DISCRETE MATHEMATICS**

**DATE: AUGUST 2016 TIME: 2 HOURS**

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

**QUESTION ONE (30 MARKS)**

1. Define the following terms
2. A tautology (1 mark)
3. A set (1 mark)
4. A contingency statement (1 mark)
5. Let  and . Evaluate
6.  (2 marks)
7.  (1 mark)
8.  (2 marks)
9. Show that if  is odd then  is odd. (3 marks)
10. Determine the truth value of the following compound propositions:
11. If 1+1=2, then birds can fly (2 marks)
12. Nairobi is the only city in Kenya and 2+3=6 (2 marks)
13. 1+1=3 if and only if monkeys can fly. (2 marks)
14. Let with  Find the domain and the corresponding range of f. (2 marks)
15. Prove that  is irrational using proof by contradiction (4 marks)
16. Assuming that p is true, q is false and r is true, find the truth value of the propositions
17.  (3 marks)
18.  (4 marks)

**QUESTION TWO (20 MARKS)**

1. Let be defined by  and  . Find
2.  (3 marks)
3.  (3 marks)
4.  (2 marks)
5. Determine whether f is a bijective mapping (3 marks)
6. State the necessary and sufficient condition of the conditional proposition “If someone is a mother, then she must be a lady.’ (3 marks)
7. Write the inverse, converse and contrapositive of the following statement “If 2+3=5, then pigs can fly.” (6 marks)

**QUESTION THREE (20 MARKS)**

1. Prove by mathematical induction  (6 marks)
2. Use truth tables to decide whether the following proposition is a tautology, a contradiction or a contingency proposition.

 (10 marks)

1. Prove using contraposition “If 3n+2 is odd, then n is odd.” (4 marks)

**QUESTION FOUR (20 MARKS)**

1. Let  and . Find
2.  and , where is the power set of B. (4 marks)
3.  (3 marks)
4. In a survey involving 60 people, 25 like milk, 26 tea and 26 coffee, 9 like both milk and tea, 11 like milk and coffee, 8 like coffee and tea and 8 like none of the three drinks.
5. Draw a Venn diagram representing the information above. (4 marks)
6. Find the number of people who like any of the three drinks (2 marks)
7. Find the number of people who like coffee, tea and milk alone (3 marks)
8. Prove that is divisible by 3 whenever n is a positive integer. (4 marks)