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**University Examinations 2015/2016**

**FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF SCIENCE MATHEMATICS AND COMPUTER SCIENCE, BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE, BACHELOR OF SCIENCE PHYSICAL OPTION, BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY, BACHELOR OF SCIENCE STATISTICS AND BACHELOR OF INFORMATION TECHNOLOGY**

**SMA 3111: DISCRETE MATHEMATICS**

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

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

**QUESTION ONE - (30 MARKS)**

1. **Let where and B = such that**

 **and f(4) = a. Check whether f is a bijection.(3 Marks)**

1. **Construct a truth table for the following compound proposition: (Pr) (4 Marks)**
2. **Using the set notation show that (AUB)C = ACUBC (5 Marks)**
3. **Prove that if 3n+2 is odd then n is odd. (5 Marks)**
4. **State with reasons whether each of the following is a proposition or not hence state whether True or False.**
5. **It will rain today**
6. **such that x + y = 0**
7. **such that = 4**
8. **Let u =**

 **A = B =**

 **Find:**

1. **Ac UB (2 Marks)**
2. **(2 Marks)**
3. **(2 Marks)**
4. **(3 Marks)**

**QUESTION TWO (20 MARKS)**

1. **Use mathematical induction to show that n (7 Marks)**
2. **Prove that if n is an even integer, then is even. (4 Marks)**
3. **Let A = and B = . Define f: Aby f(p) = x, f(q) = y, f(r) = z**

**f(s) = w, and f(t) = y. Find the domain , co domain and the image of f. (4 Marks)**

1. **Given that and find;**
2. **fog and state the domain**
3. **fog(-1) (5 Marks)**

**QUESTION THREE (20 MARKS)**

1. **A survey carried out on social media at MUST revealed the following: Out of a group of 120 students, 70 students prefer Twitter, 45 Facebook and 53 Whatsapp. In addition 25 prefer Twitter and Facebook, 10 Facebook and Whatsapp and 23 Twitter and Whatsapp. Find the number of students who prefer;**
2. **All the three**
3. **Exactly two of the three**
4. **Facebook only (10 Marks)**
5. **Given that A-B= , show that ;**

**A – (BUC) = A-B) (A-C) (4 Marks)**

1. **Let A =, B =. Find;**
2. **(2 Marks)**
3. **(2 Marks)**
4. **Represent A in a venn diagram. (2 Marks)**

**QUESTION FOUR (20 MARKS)**

1. **Define the following terms as used in logic;**
2. **A proposition (1 Mark)**
3. **A valid argument (2 Marks)**
4. **Logical equivalence (2 Marks)**
5. **Check whether the following compound proposition is a tautology: (P (8 Marks)**
6. **Write the inverse converse and contrapositive of the statement, “If you are a mathematics student then you can access internet from campus”. (3 Marks)**
7. **Negate the following statements:**
8. **: = y (2 Marks)**
9. **every student in class has done calculus. (2 Marks)**

**QUESTION FIVE (20 MARKS)**

1. **Differentiate between a tautology and a contingency. (2 Marks)**
2. **Test the validity of the following argument;If I miss the bus, I will be late for school. I miss the bus therefore I am late for school.” (4 Marks)**
3. **Prove that is irrational. (5 Marks)**
4. **Given u = , Find the following subsets.**
5. **Natural numbers**
6. **Prime numbers**
7. **Integers**
8. **Rational numbers (4 Marks)**
9. **Prove using Boolean algebra AC (5 Marks**