

**W1-2-60-1-6**

**JOMO KENYATTA UNIVERSITY**

**OF**

**AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2014/2015**

**YEAR 1 SEMESTER I EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE ACTURIAL SCIENCE AND BACHELOR OF SCIENCE MATHEMATICS AND COMPUTER SCIENCE**

**YEAR 1 SEMESTER II BACHELOR OF INFORMATION TECHNOLOGY**

**SMA 2100: DISCRETE MATHEMATICS**

**DATE: April 2015 TIME: 2 HOURS**

**INSTRUCTIONS: Answer question ONE and any other TWO questions**

**QUESTION ONE (30 MARKS)**

1. Define the following terms:
2. Union of a set (1mark)
3. Relative complement (1mark)
4. Tautology (1mark)
5. Injection function (1mark)
6. Given that ε is the set of natural numbers less than or equal to 20, list the members of the following subset of ε
7. $A$ the multiples of 3 (2marks)
8. $B$ the multiples of 4 (2marks)
9. $A^{'}$ (2marks)
10. $B^{'}$ (2marks)
11. $(A∪B)^{'}$ (2marks)
12. $(A∩B)^{'}$ (2marks)
13. Represent the following in a Venn diagram
14. Disjoint of set $A$ and $B$ (2marks)
15. $A^{'}$ (2marks)
16. Suppose $s=\{1, 2, 3\}$, evaluate the power(s) (3marks)
17. Determine the validity of the following arguments

S1: $All my friends are musicians $

S2:$ John is my friend$

S3: $\frac{None of my neighbour is a musician}{s:John is not my neighbour }$ (3marks)

1. Write the negation of the statement ‘No cats have fleas’ (2marks)

**QUESTION TWO (20 MARKS)**

1. Construct a truth table for the statement $pΛ(\~pΛ\~q)$ (6marks)
2. If $f\left(x\right)=x^{2}-1$ and $g\left(x\right)=3x+5$ find
3. $\left(fog\right)\left(x\right)$
4. $(gof)(x)$
5. $(gof)(2)$ (6marks)

c) Determine whether each set defines a function

1. $S=\{(-2,1), (-1,2), (0, 0), (-1, 1), (-2, 2)\}$ (2marks)
2. $T=\{(-2,1), (-1,2), (0, 0), (1, 2), (2, 1)\}$ (2marks)
3. $U=\{(1, 4), (2, 3), (3, 2), (4, 3), (5, 5)\}$ (2marks)
4. $W=\{(1, 4), (2, 3), (3, 2), (2, 4), (1, 5)\}$ (2marks)

**QUESTION THREE (20 MARKS)**

1. Define the following words
2. Injection (2marks)
3. Surjections (2marks)
4. Bijections (2marks)

b) Give a direct proof of the theorem

 “If $n $is an odd integer, then $n^{2}$ is an odd integer” (5marks)

c) Give an indirect proof of the theorem

 “If $3n+2$ is odd then $n$ is odd” (4marks)

d) Construct a truth table for $(\~p\rightarrow \~q)\rightarrow (\~pΛq)$ (5marks)

**QUESTION FOUR**

100 students were asked whether they have taken courses in any of the three areas, physics, chemistry and biology. The results were as follows;

45 have taken Physics

38 have taken Chemistry

21 have taken Biology

18 have taken Physics and Chemistry

9 have taken Physics and Biology

4 have taken Chemistry and Biology

23 have taken no course in any of the three areas

1. How many took all the three subjects? (8marks)
2. Draw a Venn diagram to represent this findings (8marks)
3. Determine the number k of students who had taken classes in exactly; one of the areas (4marks)