

ALUPE UNIVERSITY
COLLEGE
Bastion of Knowledge...

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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELOR
OF COMPUTER SCIENCE

SCHOOL: SCIENCE

COURSE CODE: COM 113

COURSE TITLE: MATHEMATICS FOR
COMPUTER SCIENCE

DATE: 11th December, 2017 TIME: 9.00am-12.00pm

INSTRUCTION TO CANDIDATES: SEE INSIDE

THIS PAPER CONSISTS OF 24 PRINTED PAGES

For examiner's Use Only

| Question | I.E | E.E |
|--------------|-----|-----|
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| CAT | | |
| EXAM | | |
| TOTAL | | |



PLEASE TURN OVER

Insert the numbers of the questions you have answered in the order done

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Student Admission No.....Exam Card No.....Signature.....

INSTRUCTIONS TO CANDIDATES

1. Write your **Admission Number**, **Exam Card Number** and **Sign** in the spaces provided at the bottom of each page of the Examination Booklet. DO NOT write your name anywhere in this booklet.
2. Write on both sides of the pages.
3. All rough work must be done in the Answer sheets and crossed through.
4. If supplementary pages are used, they must be fastened all together at the end of this Booklet. Supplementary pages should be used only after all the leaves in the booklet have been exhausted.
5. It is a serious examination offence to cheat or to have unauthorized materials including **MOBILE PHONES** (whether on or off) in the examination venue.
6. In no circumstances must Answer Booklet used or unused, be removed from the examination room by a candidate.
7. The Booklet is for **Examination use only** in a designated examination room. Unauthorized possession of the Answer sheets by a student or any other person constitutes an examination irregularity calling for stiff disciplinary action.
8. Do not pluck any page from this Booklet. Any extra/unused answer sheets should be returned to the **Examination Office**.
9. Candidates who come to examination room 30 minutes late will not be allowed to sit for the exam.
10. Candidates will not be allowed to leave the exam room once the exam commences.
11. Candidates are advised that importance is attached by examiners to accuracy and clarity of expression.
12. Committing any form of irregularity is prohibited and shall attract severe disciplinary action in accordance with Alupe University College Examination Regulations.

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INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

Duration of the examination: 3 hours

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SECTION A (31 marks)**QUESTION ONE 16MKS**

a. What do you understand by the following symbols, explain giving example :- [4mks]

i. \exists

ii. Z

iii. Q

iv. $(A^c)^c$

b. Given the alphabet $A = \{x, y\}$ Define a language L_1 over A to be a set of all strings that begin with the character x and have a length of at most three characters. [4mks]

c. Explain using examples the following laws of sets: - associative law and commutative law.

[4mks]

d. Explain four properties of an empty set.

[4mks]

QUESTION TWO 15MKS

a) Define the following terms

i) Inverse of a function [1mk]

ii) Quantifier [1mk]

iii) Rational number [1mk]

iv) Domain [1mk]

v) Open sequence [1mk]

b) State the principle of mathematical induction [3mks]

c) Given that $A = \{1, 2, 3\}$ and $B = \{a, b\}$. Find

a) $A \times B$ [1mk]

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b) $B \times A$

[1mk]

c) $B \times B$ [1mk]

d) Consider the following five relations on set $A = \{1, 2, 3\}$

$$R = \{(1,1), (1,2), (1,3), (3,3)\}$$

$$S = \{(1,1), (1,2), (2,1), (2,2), (3,3)\}$$

$$T = \{(1,1), (1,2), (2,2), (2,3)\}$$

$\emptyset = \text{empty relation}$

$A \times A = \text{Universal relation}$

Determine whether or not each of the above relations on A is:

a) Reflexive

[1mk]

b) Symmetric

[1mk]

c) Transitive

[1mk]

d) Anti-symmetric

[1mk]

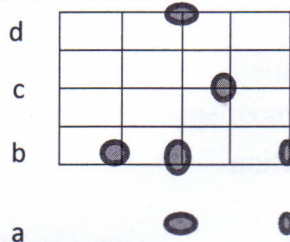
SECTION B (39 marks)

QUESTION THREE 13MKS

a) Given $A = \{1, 2\}$, $B = \{a, b, c\}$ and $C = \{c, d\}$. Find $(A \times B) \cap (A \times (B \cap C))$

[4mks]

b) Let $M = \{a, b, c, d\}$ and let R be the relation on M consisting of those points which are displayed on the coordinate diagram of $M \times M$.



i) Find all the elements in M which are related to b , that is, $\{x : (a, b) \in R\}$

ii) Find all those elements in M to which d is related, that is $\{x : (d, x) \in R\}$

iii) Find the inverse relation R^{-1}

QUESTION 4 [13 MKS]

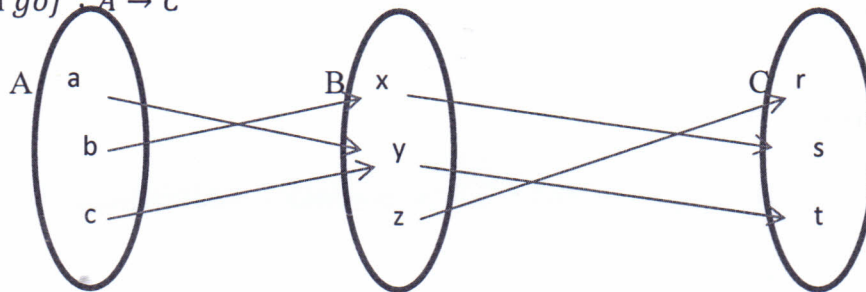
a. Given $A = \{1,2,3,4\}$ AND $B = \{x,y,z\}$. consider the following relations from A to B.

$$R = \{(1,y), (1,z), (3,y), (4,x), (4,z)\}$$

- i) Plot R on a coordinate diagram of $A \times B$ [3mks]
- ii) Determine the matrix of the relation [3mks]
- iii) Draw the arrow diagram of R. [3mks]
- iv) Find the inverse relation R^{-1} of R [2mks]
- v) Determine the domain and range of R [2mks]

QUESTION 5 [13 MKS]

a. Let the function $f: A \rightarrow B$ and $g: B \rightarrow C$ be defined as shown in the figure. Find the composite function $g \circ f: A \rightarrow C$ [3mks]



b) Determine if each function is a one-one

- i) To each person on the earth assign the number which corresponds to his age . [1mk]
- ii) To each country in the world assign the latitude and longitude of its capital. [1mk]
- iii) to each book written by only one author assign the author. [1mk]
- iv) To each country in the world which has a prime minister assign its prime minister. [1mk]

c) Find the cardinal numbers of each set

- i) $A = \{a, b, c, \dots, y, z\}$ [1mk]
- ii) $B = \{1, -3, 5, 11, -28\}$ [1mk]
- iii) $x: x \in N, x^2 = 5$ [2mks]
- iv) $D = \{10, 20, 30, 40, \dots\}$ [1mk]

v) $E = \{6,7,8,9, \dots\}$ [1mk]

QUESTION 6 [13 MKS]

a) Prove the proposition P that the sum of the first positive integers is $\frac{1}{2}n(n + 1)$. That is

$P(n): 1 + 2 + 3 + \dots + n = \frac{1}{2}n(n + 1)$. [5mks]

b) Consider the set $A = [\{1,2,3\}, \{4,5\}, \{6,7,8\}]$

i) What are the elements of A? [2mks]

Determine whether each of the following is true or false

ii) $1 \in A$ [1mk]

iii) $\{1,2,3\} \subset A$ [1mk]

iv) $\{6,7,8\} \in A$ [1mk]

v) $\{\{4,5\}\} \subset A$ [1mk]

vi) $\emptyset \notin A$ [1mk]

vii) $\emptyset \subset A$ [1mk]

QUESTION 7 [13 MKS]

a. A survey of 100 students produced the following statistics;

32 study mathematics

20 study physics

45 study biology

15 study mathematics and biology

7 study mathematics and physics

10 study physics and biology

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30 do not study any of the three subjects

- i) Find the number of students studying all three subjects [4mks]
- ii) Fill in the number of students in each of the eight regions of the venn diagram [5mks]
- iii) Find the number of students taking exactly one of the three subjects [4mks]

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