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OFFICE OF THE DEPUTY PRINCIPAL

ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2018 /2019 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: COM 113

COURSE TITLE: MATHEMATICS FOR COMPUTER SCIENCE I

DATE: 17TH December, 2018

TIME: 9.00AM – 12.00PM

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 5 PRINTED PAGES

PLEASE TURN OVER

COM 113: MATHEMATICS FOR COMPUTER SCIENCE I

STREAM: BSc (Computer Science)

DURATION: 3 Hours

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INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and **ANYTHREE** Questions in section B.

All questions in section B carry Equal Marks

Duration of the examination: 3 hours

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SECTION A

QUESTION 1 (16 MKS)

a) Define the following terms:

- | | | |
|--------------------|-------|-------|
| i) A set | | [1mk] |
| ii) Empty set | [1mk] | |
| iii) Universal set | | [1mk] |
| iv) Disjoint set | | [1mk] |

b) State the relation between the following sets giving a venn-diagram to illustrate:

- | | | |
|----------------------------------|--|-------|
| i) A={January,June} | | |
| B={first six months of the year} | | [1mk] |
| ii) M={Birds}, W= {fish} | | [1mk] |
| iii) P={Febuary, March ,October} | | |
| Q={first six months of the year} | | [1mk] |

c) Let $A = \{2,3,4\}$ and $B = \{2,6,8\}$ and let R be the “divides” relation from A to B. For all

$(x,y) \in A \times B, x R y \leftrightarrow x/y$ (x divides y).

- | | |
|--|--------|
| i) State explicitly which ordered pairs are in R | [3mks] |
| ii) Find R^{-1} | [3mks] |
| iii) Describe R^{-1} in words. | [3mks] |

QUESTION 2 [15 MKS]

a) If $n(A \cup B) = 45$, $n(A \cap B) = 5$, $n(B) = 22$. Find the value of $n(A)$ and illustrate by venn-diagram?

[2mks]

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

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

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

What are the elements of A?

[2mks]

d) Determine whether each of the following is true or false from c above?

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

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

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

iv) $\{\{4,5\}\} \subset A$

[1mk]

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

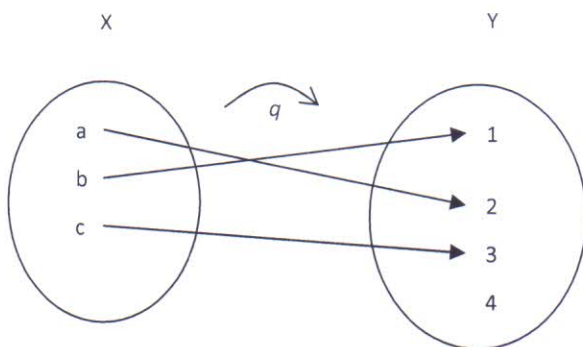
vi) $\emptyset \subset A$ [1mk]

SECTION B

QUESTION 3 [13 MKS]

a. Let $X = \{a,b,c\}$ and $Y = \{1,2,3,4\}$. Define a function f from X to Y by the arrow diagram

below:-



i. Write the domain and co-domain of q .

[2 mks]

ii. Find $q(b)$ and $q(c)$.

[2 mks]

iii. What is the range of q ?

[2 mks]

iv. Find the inverse images of 4, 2, 1.

[3 mks]

b. Draw a diagram to define a function f from the set of all integers Z to itself by the rule

$n \rightarrow 2n$ that is $f(n) = 3n$ for all $n \in \mathbb{Z}$.

[4mks]

QUESTION 4 [13 MKS]

A survey of 100 students out of 120 computer science students in Alupe University take at least one of the languages French, German, and Russian. Also suppose;

65 study french

20 study German

42 study Russian

20 study French and German

25 study French and Russian

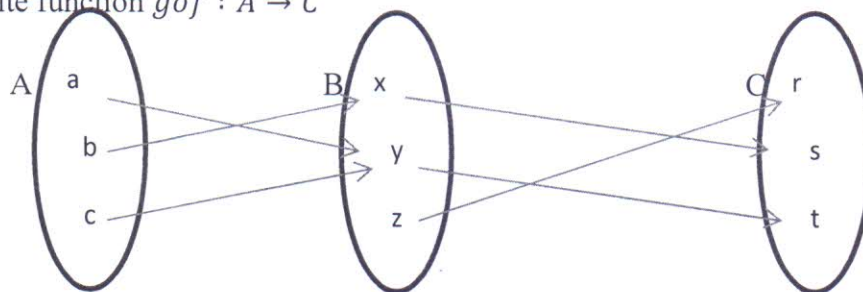
15 study German and Russian

20 do not study any of the three languages

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

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
- To each person on the earth assign the number which corresponds to his age. [1mk]
 - 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. Let p be the set $\{a, b, c, d, e, f, g, h\}$, let $A = \{a, d, e, h, g\}$ and $B = \{d, e, f, g\}$. Find $A \cup B$, $A \cap B$ and A^c and draw the Venn diagram for the representations. [7mks]

b. Explain the following laws of sets:- distributive law, intersection with U and absorption law. [6 mks]

QUESTION 7 [13 MKS]

a. Draw a binary tree to represent the expression $((x-y)^* d + (d/e))$. [3mks]

b. Explain the following terms: - reflexive, transitive and symmetric. [6mks]

c. When do you have an empty set? [4 mks]

