Ser. No. IS 060/18

GARISSA UNIVERSITY

UNIVERSITY EXAMINATION 2017/2018 ACADEMIC YEAR ONE SECOND SEMESTER EXAMINATION

SCHOOL OF INFORMATION SCIENCE

FOR THE DEGREE OF BACHELOR OF INFORMATION SCIENCE

COURSE CODE: COM 123

COURSE TITLE: MATHEMATICS FOR COMPUTER SCIENCE

EXAMINATION DURATION: 3 HOURS

DATE: 06/04/18 **TIME: 09.00-12.00 PM**

INSTRUCTION TO CANDIDATES

- **The examination has SIX (6) questions**
- **Question ONE (1) is COMPULSORY**
- **Choose any other THREE (3) questions from the remaining FIVE (5) questions**
- **Use sketch diagrams to illustrate your answer whenever necessary**
- **Do not carry mobile phones or any other written materials in examination room**
- **Do not write on this paper**

This paper consists of FOUR (4) printed pages ***please turn over***

QUESTION ONE (COMPULSORY)

(a) Define the following terms

i. Proposition **[1 mark]**

ii. Simple proposition **[1 mark]**

iii. Tautology **[1 mark]**

iv. Predicate **[1 mark]**

(b) When are two compound propositions, A and B said to be logically equivalent? **[1 mark]**

(c) Show that $\sim\{P\vee(\sim P\wedge Q)\}$ and $\sim P\wedge\sim Q$ are logically equivalent by developing a series of logical equivalences. **[5 marks]**

(d) Outline five steps you must follow to determine the validity/invalidity of an argument **[5 marks]**

(e) Demonstrate that $P\wedge(Q\wedge R)\vDash(P\wedge Q)\wedge R$ **[5 marks]**

(f) Test the validity of the following argument: "If you insulted Ahmed then I will never speak to you again. You insulted Ahmed so I will never speak to you again" **[5 marks]**

QUESTION TWO

(a) Define "$Universal\ Quantification$" . Use our definition to express symbolically, the statement "$Every\ student\ in\ this\ class\ has\ studied\ calculus$". **[5 marks]**

(b) Test the validity of the following argument using a truth table: "If I leave the University then I will get a job in the bank". "I am not leaving he University so I won't get a job in a bank" **[7 marks]**

(c) Represent the following argument symbolically: "If you sit idle, you put on weight". You sit idle, You put on weight. **[3 marks]**

QUESTION THREE

(a) Obtain the Principal Disjunctive Normal Form of $(\sim P\wedge\sim Q)\Rightarrow(\sim P\wedge Q)$ **[5 marks]**

(b) Define the following on the universe of men:

$$M(x):\ x\ \ Is\ mortal \text{ And}$$

$$C(x):\ x\ \ Lives\ in\ the\ city$$

Symbolize the negations of the following propositions, changing the quantifier:

i. All men are immortal

ii. Some men live in the city.

In each case, write the alternative statements in some reasonable English **[6 marks]**

(c) State the rules applied in generating a well formulated formula **[4 marks]**

QUESTION FOUR

(a) The following predicates and individuals are defined thus:

$$m: Maria$$

$$s: Maria's son$$

$$C: Works\ in\ the\ city$$

$$B: rides\ a\ bicycle$$

$$F: is\ a\ chicken\ farmer$$

Symbolize the following:

i. Maria works in the city and her son is a chicken farmer

ii. If Maria rides a bicycle, then her son works in the city

iii. Everyone who works in the city is a chicken farmer

iv. Everyone who works in the city and does not ride a bicycle is a chicken farmer

v. Some people who work in the city and ride a bicycle are not chicken farmers

[5 marks]

(b) Show that the following is a valid argument, indicating the rule being applied a each stage: "All students go to parties. Some students drink too much. Therefore, some people who drink too much go to parties.

QUESTION FIVE

(a) By using the contra positive, prove that for any integer n, ifn^2 is even, then n is even.

[5 marks]

(b) Using the conditional position, prove that if m and n are integers and 3 is a factor of both$m$ and n, then 3 is a factor of any number of the form $nx + my$where x and y are integers

[5 marks]

(c) Show that $\sqrt{2}$ is irrational **[5 marks]**

QUESTION SIX

(a) Translate into English, the statement $\forall_x \forall_y (x > 0) \wedge (y < 0) \rightarrow (xy < 0)$where the domain for both variables consists of all real numbers. **[2 marks]**

(b) Translate the following into symbolic form using two place predicates

i. Everybody loves somebody

ii. Somebody loves everybody

iii. If a person is female and is a parent, then this person is someone's mother. **[8 marks]**

(c) Find a logic form for the truth table below and check your results.

p	q	??
T	T	T
T	F	T
F	T	T
F	F	F

[5 marks]