ALUPE UNIVERSITY COLLEGE

... *Bastion of Knowledge* ...

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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH
UNIVERSITY EXAMINATIONS

2018 /2019 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE)

COURSE CODE: COM 123

COURSE TITLE: MATHEMATICS FOR COMPUTER SCIENCE II

DATE: 23/4/2019   TIME: 9.00 AM - 12.00 PM

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

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COM 123: MATHEMATICS FOR COMPUTER SCIENCE II

STREAM: BSC COMPUTER SCIENCE   **DURATION: 3 Hours**

INSTRUCTION TO CANDIDATES

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

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SECTION A

QUESTION ONE (15 MKS)

   a. Define the following terms
      i. Conjunction   [1mk]
      ii. Disjunction   [1mk]
      iii. Negation   [1mk]
      iv. Argument   [1mk]
      v. Implication   [1mk]
      vi. Biconditional statement   [1mk]
   b. Differentiate between a tautology and a contradiction.   [2mks]
   c. Consider the following proposition. "If this book is interesting, then I am staying at home". Write the;
      i. converse of the proposition   [1mk]
      ii. Inverse of the proposition   [1mk]
      iii. Contrapositive of the proposition   [1mk]

   d. Construct truth tables for the following propositions;

     i) $\sim p \vee q$ [2mks]

     ii) $\sim (p \vee q)$ [2mks]

QUESTION TWO [16 MKS]

a) Determine the Boolean expression for the switching circuit shown below.   [4mks]
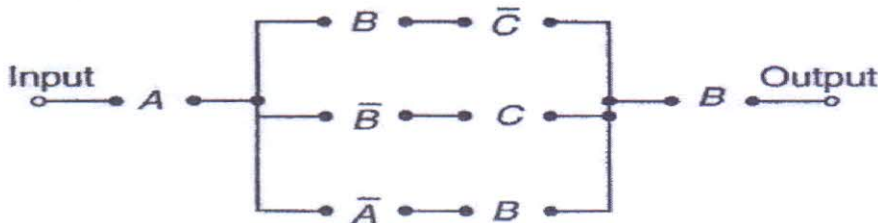
b) Construct the truth table for the switch given in (a) above   [5mks]
c) Define the terms predicate and universally true predicate   [3mks]
d) Let p be "Audrey speaks French" and let q be "Audrey speaks Danish". Give a simple verbal sentence which describes each of the following
   (i) pVq   (ii) ~pV~q (iii) ~~p   (iv) ~(~p∧~q)   [4mks]

SECTION B

ANSWER ANY THREE QUESTIONS

QUESTION THREE [13 MKS]

a) Consider the Boolean algebra D_{210}
   i.   List its elements and draw its diagram   [3mks]
   ii.   Find the set A of atoms   [2mks]
   iii. Find two sub algebras with eight elements   [2mks]
   iv.   Is X = {1,2,6,210} a sub lattice of D_{210} [1mks]
   v.   Is Y = {1,2,3,6} a sub lattice of D_{210} [1mks]
   vi.   Find the number of sub algebras in D_{210} [1mks]

b) Differentiate between a universal quantifier and existential quantifier   [3mks]

QUESTION FOUR [13MKS]

Express the following Boolean expression $E(x, y, z)$ in dnf and in full dnf.

a) $E_1 = x(y'z)'$ [5mks]

b) $E_2 = z(x' + y) + y'$ [5mks]

c) $E_3 = z(x' + y)' + x'y$ [3mks]

QUESTION FIVE [13MKS]

a) Prove Demorgan's laws;
i. $\sim (p \wedge q) \equiv \sim p \vee \sim q$ [3mks]
ii. $\sim (p \vee q) \equiv \sim p \wedge \sim q$ [3mks]

b) Test the validity of the following statement argument.   [5mks]

If a man is a bachelor, he is unhappy.

If a man is unhappy, he dies young.

....

Bachelors die young.

c) Find the converse of P→ Q   [2mks]

QUESTION SIX [13MKS]

a) Define the following;
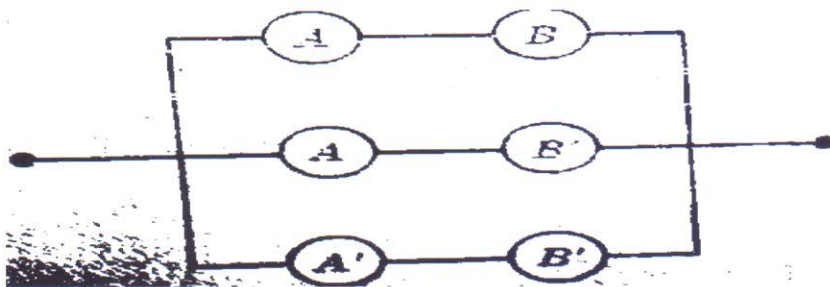
    i.   Prefix notation   [2mks]
    ii. Infix notation   [2mks]
    iii. Postfix notation   [2mks]

b) Let X = {a, b, c}. Define the relation R on X as {(a, b), (b, c)}. Find the reflexive, symmetric, and transitive closure of R. Also, find the reflexive and transitive closure of R.   [7mks]

QUESTION SEVEN [13MKS]

Consider the circuit in the diagram below

a) Construct a simpler equivalent circuit   [6mks]

b) Verify that the circuits are equivalent by finding their "truth" tables   [7mks]

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