



UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: CE 473

COURSE NAME: LOGIC OF COMPUTER SCIENCE

CLASS: CE IV

TIME: 3 HOURS

Name: _____ Index Number: _____

Answer any seven questions. All questions should be answered in the answer booklet provided

1. Let p stand for the proposition "I bought a lottery ticket" and q for "I won the jackpot". Express the following as natural English sentences:
 - a. $p \rightarrow q$
 - b. $\neg p \rightarrow \neg q$
 - c. $\neg p \vee (p \wedge q)$
2. Formalise the following in terms of atomic propositions r , b , and w , first making clear how they correspond to the English text.
 - a. It is not safe to walk along the path, but rabbits have not been seen in the area and the berries along the path are ripe.
 - b. For walking on the path to be safe, it is necessary but not sufficient that berries not be ripe along the path and for rabbits not to have been seen in the area.
 - c. Walking is not safe on the path whenever rabbits have been seen in the area and berries are ripe along the path.
3. For each of the following propositions, construct a truth table and state whether the proposition is valid or satisfiable.
 - (a) $p \rightarrow (\neg q \vee r)$
 - (b) $\neg p \rightarrow (q \rightarrow r)$
 - (c) $(p \rightarrow q) \vee (\neg p \rightarrow r)$
4. Show of Tautology, contradiction or otherwise
 - a. $p \rightarrow p \vee q$
 - b. $((p \vee q) \wedge \neg p) \rightarrow q$
 - c. $\neg(p \vee \neg(p \wedge q))$
5. Reduce to Conjunctive Normal Form (CNF) the formula:
 - a. $\neg(\neg p \vee q) \vee (r \rightarrow \neg s)$,
 - b. $(\neg p \rightarrow q) \rightarrow (q \rightarrow \neg r)$
 - c. $p \rightarrow (q \wedge r)$
6. For each of the following formulae, prove with deduction rules that, the conclusion (in square bracket to the right of each) is valid.
 - a) $p \wedge \neg q \rightarrow r, \neg r, p$ **[q]**
 - b) $p \rightarrow q, p \rightarrow \neg q$ **[-p]**
 - c) $p \rightarrow (q \rightarrow r), p, \neg r$ **[-q]**

7. Let $A = \{1, 2, 3, 4, 5\}$. Determine the truth value of each of the following statements:

- i. $(\exists x \in A)(x + 3 = 10)$
- ii. $(\forall x \in A)(x + 3 < 10)$
- iii. $(\exists x \in A)(x + 3 < 5)$
- iv. $(\forall x \in A)(x + 3 \leq 7)$

8. Write the following statements into its predicate calculus forms:

- i. If A likes B and B likes C, then it does not imply that A likes C.
- ii. Combustion of fuels takes place if fuel, air, and spark are present.
- iii. Everyone loves someone.
- iv. Everyone loves his or her parents
- v. Everyone loves everyone
- vi. There is someone who loves everyone

Examiner: *W. A. Agangiba*