

COMP21111 Assignment 1
20 marks

Show your working.

Deadline: 8th Oct., 12pm (noon), SSO
Deadlines are strict

Problem 1 (5 marks)

The following formula has its parentheses removed.

1. Restore the parentheses and
2. list all its subformulas.

$$\neg p_1 \rightarrow \neg \neg p_2 \leftrightarrow p_3 \wedge p_4.$$

Problem 2 (7 marks)

Consider the following two formulas:

$$p \rightarrow q \wedge \neg p$$
$$(p \rightarrow q \wedge p) \vee (p \leftrightarrow \neg q \vee p)$$

Use truth tables for these formulas to check

1. satisfiability and
2. validity.

Justify your answers based on the truth tables.

Problem 3 (5 marks)

Formalise in propositional logic the following statement:

“If it is raining then I need an umbrella” (1)

a) identify atomic propositions in (1) b) denote them with propositional variables c) write a propositional formula corresponding to (1).

Using propositional formalisation check whether (1) is equivalent to:

1. If I need an umbrella then it is raining.
2. If I do not need an umbrella then it is not raining.

Problem 4 (3 marks)

A propositional formula $A(p_1, \dots, p_n)$ of atoms p_1, \dots, p_n is called a parity check formula if its models are exactly those that satisfy an even number of atoms among p_1, \dots, p_n . Find parity check formulas which contain exactly one occurrence of each atom.