

CM0845 Logic

Assignment 1

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1 Deadline

August 24, 2025, 23:59.

2 Assignment

A formula is in *Conjunctive Normal Form* (CNF) if it is a conjunction of disjunctions of literals [1, Definition 4.1]. Every formula in propositional logic can be transformed into an equivalent formula in CNF [1, Theorem 4.3].

Design an algorithm to translate propositional formulae to its conjunctive normal form. This can be implemented in any programming language.

3 Syntactical Conventions

The set of well-formed formulae is defined by the following grammar:

$$F ::= p \mid \neg F \mid F \ \& \ F \mid F \vee F \mid F \rightarrow F \mid F \leftrightarrow F$$

Precedence

The operators have the following precedence.

<i>Higher</i>	
\neg	Negation
$\&$	Conjunction
\vee	Disjunction
\rightarrow	Implication
\leftrightarrow	Equivalence
<i>Lower</i>	

3.1 Required

1. Algorithm to translate any formula to its CNF.
2. Implement Tseitin Encoding [1, Algorithm 4.50].
3. A README.md file (Markdown format) in English. It must contain:
 - Full name.
 - Versions used of operating system, compiler and tools in your implementation.
 - Detailed instructions for running your solution.
 - Detailed explanation of your solution.
 - Do not include any unnecessary files or directories in the repository.
 - Details about the reference sources (books, articles, videos, AIs, repositories, etc.).
 - Make sure your code is both clean and organized. For example, it should not contain unnecessary comments or unused code.

3.2 Weights for Grading

1. Oral presentation: 70%.
2. Code: 20%.
3. README file: 10%.

References

- [1] Mordechai Ben-Ari. *Mathematical Logic for Computer Science*. en. London: Springer London, 2012. ISBN: 978-1-4471-4128-0 978-1-4471-4129-7. DOI: [10.1007/978-1-4471-4129-7](https://doi.org/10.1007/978-1-4471-4129-7). URL: <http://link.springer.com/10.1007/978-1-4471-4129-7> (visited on 07/17/2025).