

Semantic Web (CSE632)

Assignment-2

Winter 2024

Max marks: 100

Instructions

- Each student has to work on this by themselves.
- Plagiarism checks and policies will be strictly enforced. If you use ChatGPT and similar tools, please clearly indicate in a ReadMe where and how they were used.
- Your zip folder should be named RollNo_Assignment2.zip.

1. **Negation Normal Form.** Create a Python program which takes DL formulas as input, consisting of $\sqcup, \sqcap, \sqsubseteq, \neg$ and \equiv operators. It outputs the formula in negation normal form. Your code should work for four concepts A, B, C, D and two roles R, S . Two test cases are as follows.

- $\neg(\neg A \sqcup \forall R.B) \sqcup (C \sqsubseteq \neg D)$
- $(\neg A \sqsubseteq \exists S.B) \equiv (B \sqsubseteq \neg C)$

Use the following digits to represent the logical constructs and quantifiers in the code.

- \sqcap - 0
- \sqcup - 1
- \neg - 2
- \sqsubseteq - 3
- \equiv - 4
- \exists - 5
- \forall - 6

Do not hard code the test cases. Please submit the following.

[50]

- Python code.
- Output to the above two formulas.

2. **Tableau.** Construct a Python program implementing the propositional calculus tableau, consisting of \wedge , \vee , and \neg operators. Implement two levels of the tableau tree (excluding the root of the tree). The program should implement the tableau rules for the three operators and not simplifications of the formulas. Print the formulas and their corresponding signed truth value at each level of the tree, including the root. The program should work with three variables p, q and r . Sample test cases are as follows.

- $((\neg p \wedge q) \wedge (\neg p \vee \neg q))$
- $(\neg p \wedge q) \vee (q \wedge \neg p)$

Use the following digits to represent the operators.

- \wedge - 0
- \vee - 1
- \neg - 2

Do not hard code the test cases. Please submit the following.

[50]

- Python code.
- Output to the above two formulas.