

CSE541 Exercise 2

SOLVE ALL PROBLEMS as PRACTICE and only AFTER look at the SOLUTIONS!!

Please write solutions very carefully. The grade you receive on TESTS depends not only on the fact that you SOLVE the problem, but also (30%) on elegance of your solution. Use examples from the book as a learning material of how to write solutions properly

QUESTION 1 Give a definition and an example of a default reasoning.

QUESTION 2 Write the following natural language statement:

*From the fact that it is not necessary that an elephant is not a bird we deduce that:
it is not possible that an elephant is a bird or, if it is possible that an elephant is a bird, then it is not necessary that a bird flies.*

as a formula

(i) $A_1 \in \mathcal{F}_1$ of a language $\mathcal{L}_{\{\neg, \mathbf{C}, \mathbf{I}, \cap, \cup, \Rightarrow\}}$,

(ii) $A_2 \in \mathcal{F}_2$ of a language $\mathcal{L}_{\{\neg, \cap, \cup, \Rightarrow\}}$.

2. Main connective of the formula A_1 is: , main connective of the formula A_2 is:

3. Degree of the formula A_1 is: , degree of the formula A_2 is:

4. Write all proper, non-atomic sub-formulas of A_1 .

5. Write all non-atomic sub-formulas of A_2 .

6. Find a restricted model and a restricted counter-model of A_2 . Use short-hand notation. Show work.

7. There are more than 3 possible restricted counter-models of A_2 . Justify.

8. There are more than 2 possible restricted models of A_2 . Justify your answer.

9. List 3 models and 2 counter-models for A_2 by extending the restricted model and the counter-model you have found in 6. to the set VAR of all variables.

10. There are possible models for A_2 .

There are possible counter-models for A_2 .

QUESTION 3 Show that

$$\models ((\neg a \cup b) \Rightarrow (((c \cap d) \Rightarrow \neg d) \Rightarrow (\neg a \cup b)))$$