

## CSE371 PRACTICE Q1

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

Write your solutions CAREFULLY and COMPARE with Solutions posted. One of the problems will appear on real Q1 as extra credit.

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

### QUESTION 2

1. (4pts) 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

$A_1 \in \mathcal{F}_1$  of a language  $\mathcal{L}_{\{\neg, \mathbf{C}, \mathbf{I}, \mathbf{O}, \mathbf{U}, \Rightarrow\}}$ ,

$A_2 \in \mathcal{F}_2$  of a language  $\mathcal{L}_{\{\neg, \mathbf{O}, \mathbf{U}, \Rightarrow\}}$ .

2. (2pts) 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. All proper, non-atomic sub-formulas of  $A_1$  are:
  
5. All non-atomic sub-formulas of  $A_2$  are:
  
6. Find a restricted model and a restricted counter-model of  $A_2$ . Use short-hand notation. Show work.

**A Restricted Model:**

**Evaluation:**

**A Restricted Counter-Model:**

**Evaluation:**

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

$$\models (\neg((a \wedge \neg b) \Rightarrow ((c \Rightarrow (\neg f \cup d)) \cup e)) \Rightarrow ((a \wedge \neg b) \wedge (\neg(c \Rightarrow (\neg f \cup d)) \wedge \neg e))).$$