



## Artificial Intelligence

### Assignment 12

Assignment due by: 31.01.2018, Discussion: 02.02.2018

#### Question 1 Resolution (4 points)

Use resolution to prove the answer to the hacking case from the previous assignment sheet.

#### Question 2 More Resolution (6 points)

Use resolution to prove the sentence  $(C \wedge \neg D) \vee E$  from the following knowledge base:

$$A \vee B, \quad B \vee C \vee E, \quad \neg B \vee C, \quad \neg B \vee \neg D, \quad \neg A \vee \neg D$$

#### Question 3 Clauses (1+2 = 3 points)

University and high school students attend the lecture “Creating a new world with virtual reality”. The professor has established that a person who is a university student (S) is allowed to present the final exam (E) if he/she submitted at least five assignments (A) but otherwise is not allowed.

(a) Which of the following are correct representations of what the professor said?

(i)  $S \implies (E \iff A)$

(ii)  $(S \wedge E) \iff A$

(iii)  $S \implies (A \implies E)$

(b) Write the sentences given in (a) as a conjunction of clauses (CNF). Is each clause in Horn clause form? Justify your answer.

#### Question 4 First order logic (7 points)

Consider a vocabulary with the following predicates,  $Occupation(p, o)$ : Person  $p$  has occupation  $o$ .  $Customer(p_1, p_2)$ : Person  $p_1$  is a customer of person  $p_2$ .  $Boss(p_1, p_2)$ : Person  $p_1$  is a boss of person  $p_2$ . Constants denoting occupations are: *Scientist*, *Physicist*, *Architect*, *Student*. Constants denoting people are: *James*, *Casey*. Use these symbols to write the following assertions in first-order logic:

- (a) James is a student, but he also holds a job.
- (b) James is not a customer of any architect.
- (c) There exists an architect all of whose customers are scientists.
- (d) Casey has a boss who is an architect.
- (e) All physicist are scientists.
- (f) Casey is either a physicist or an architect.
- (g) No physicist's boss is an architect.