CT331 Assignment 3

Declarative Programming with Prolog

Due Date: 9th November, 2017

Introduction

Please submit a PDF or docx file clearly showing the following:

1. The assignment name (“CT331 Assignment 3”)
2. Your name and student ID
3. Each question title (“Question 1”), in order, displayed clearly above your answer.
4. For each question:
    a. A screenshot of your code and output, including adequate tests to demonstrate that your code works.
    b. Any comment you may have, or whatever textual answer the question requires.

Using the lab computers:

SWI Prolog should be installed on the lab computers. SEI Prolog is also available to download from http://www.swi-prolog.org/

Notes:
There is no sample repo for this lab.

Question 1

Consider the following prolog facts:

sunny.
windy.
warm.
early.
happy.

State the result value (true or false) for each of the following statements. [0.5 marks each]

1. sunny AND warm
2. sunny AND cold
3. sunny OR cold
4. (sunny OR cold) AND warm
5. happy XOR sunny
6. warm XOR (not happy)
7. early NAND happy
8. (late NOR (not early)) AND (windy OR (not warm))
9. (cloudy AND windy) AND (warm AND early)
10. (cloudy AND windy) XOR (warm OR early)

Question 2

Consider the following prolog facts:

takes(tom, ct331).
takes(mary, ct331).
takes(joe, ct331).
takes(tom, ct345).
takes(mary, ct345).
instructs(bob, ct331).
instructs(ann, ct345).

1. Write a prolog rule called ‘teaches’ that returns true if a given instructor teaches a given student.
2. Write a prolog query that uses the ‘teaches’ rule to show all students instructed by bob.
3. Write a prolog query that uses the ‘teaches’ rule to show all instructors that instruct mary.

4. What is the result of the query:
   teaches(ann, joe).
   Why is this the case?
5. Write a prolog rule called ‘classmates’ that returns true if two students take the same course. Demonstrate with suitable queries that this rule works as described.

[1 mark each]

Question 3

1. Using the “=” sign and the prolog list syntax to explicitly unify variables with parts of a list, write a prolog query that displays the head and tail of the list [1,2,3].
2. Similarly, use a nested list to display the head of the list, the head of the tail of the list and the tail of the tail of the list [1,2,3,4,5].
3. Write a prolog rule ‘contains1’ that returns true if a given element is the first element of a given list.
4. Write a prolog rule ‘contains2’ that returns true if a given list is the same as the tail of another given list.
5. Write a prolog query using ‘contains1’ to display the first element of a given list.

[1 mark each]

Optional Question 4 (0 marks)

Write a set of prolog facts and rules to check if a given element is in a given list.
Hint: Think recursively - start at the base case the consider the recursive case.