

## CSE3401 Summer 2009 Assignment #4, Due by August 21<sup>th</sup> 2009 11:59PM

**This assignment must be submitted over email, AS WELL AS, SUBMITTED IN PRINTED FORM ON AUGUST 25<sup>th</sup> BEFORE THE FINAL EXAM.**

### Exercise 1 (50 points)

Define the predicate **factorialExt(N,F)** that will be satisfied when F is equal to factorial of N. Make the predicate as robust as possible, that is, make it work if some or all the parameters are un-instantiated. If the parameters are of invalid type then the predicate should be unsatisfiable. Make the predicate to provide the alternatives where it makes sense to provide them.

**Provide comments and significant testing on input of various scenarios with your answers.**

### Exercise 2 (50 points)

Modify your predicate everyNth from Assignment #3 Question #2 and make the predicate as robust as possible. That is, make it work if some parameters are un-instantiated. If the parameters are of invalid type then the predicate should be unsatisfiable. Make the predicate to provide the alternatives where it makes sense to provide them.

**Provide comments and significant testing on input of various scenarios with your answers.**

### Exercise 2 (150 points)

Create a database with some partial data on Canadian geography. To naturally describe such geographical data, define operators: isA, isIn, populationIs. You can define other operators if you wish.

The facts that you must define are (the more complete the better, just define new facts where ... are):

'Canada' isA country.

'Ontario' isA province.

...

'Toronto' isA city.

'Niagara Falls' isA city.

...

'Toronto' populationIs 2500000.

'Niagara Falls' populationIs 70000.

...

'CN Tower' isA landmark.

'Niagara Falls' isA landmark.

...

'Ontario' isIn 'Canada'.

...

'Toronto' isIn 'Ontario'.

...

'CN Tower' isIn 'Toronto'.

...

bigcity(X) :- X isA city, X populationIs P, p>400000.

...

Then define a language to query and assert new facts to the database.

The language should handle and answer questions like:

[is, .., a, ...,?]

[is, .., a, big, city,?]

[what, are, the, provinces, in, ...,?]

[what, are, the, landmarks, in, ...,?]

[what, are, the, cities, in, ...,?]

[what, are, the, big, cities, in, ...,?]

[where, is, ...,?]

[what, is, the, population, of, ...,?]

The language should handle assertion of facts like:

[..., is, a, ...]

[..., is, in, ...]

[..., has, a, population, of, ...]

**TIP: Use grammar parsing rules with parameters to extract the answers.**

**Provide comments and significant testing on input of various scenarios with your answers.**