HW 5 – User-Defined Datatypes

CS 421 – Spring 2014
Revision 1.0

Assigned February 20, 2014
Due March 2, 2014, 11:59 pm

1 Change Log

1.0 Initial Release.

2 Turn-In Procedure

This assignment is named `hw5`. Using your favorite tool(s), you should put your solution in a file named `hw5-solution.pdf`. Your answers to the following questions are to be submitted using the svn repository as described in the section `Instruction for Solving and Submitting Assignments` on the web-page: `http://courses.engr.illinois.edu/cs421/sp2014/mps/index.html`

3 Objectives and Background

The purpose of this HW is to test your understanding of the user-defined datatypes in OCaml.

4 Problems

(25 points) Write an `bool_exp` data type in Ocaml that represents boolean expressions. Specifically, the `bool_exp` data type must be able to represent the following:

- a variable with its name given by a string
- the true boolean constant
- the false boolean constant
- the negation of a boolean expression
- the conjunction of two boolean expressions
- the disjunction of two boolean expressions

Write a function `bool_exp_eval` that takes a boolean expression (of type `bool_exp`, the data type you defined) and an environment (of type `string -> bool`) and evaluates the given boolean expression in the given environment. You may assume, without checking, that the environment maps each name occurring in the boolean expression to either `true` or `false`.

```
# let rec bool_exp_eval e env = ...;
val bool_exp_eval : bool_exp -> (string -> bool) -> bool = <fun>
```

For example, `bool_exp_eval` should evaluate $(a \wedge b) \vee \neg\top$ in the environment $\{a \mapsto$ `true`, $b \mapsto$ `false`$\}$ to `false`.