1st Semester 2015-16

CS F214

Logic in Computer Science

Assignment 1 - Problem A: Problem Statement

- Design and implement a Prolog program to verify whether primitive expressions in a language like C are type-correct. For instance,
  - an expression of the form **x + y** is type-correct if **x** and **y** are both of type ***int*** or they are both of type ***float***.
  - an expression of the form **v = e** is type-correct if the expression **e** evaluates to the same type as that of variable **v**.
- Assume that the primitive types available in the language (along with the corresponding operations) are:
  - **int** and **float (+, -, *, /, %, <, <=, >, >=, ==, !=)**
    - Comparators (<, <=, etc.) evaluate to **Boolean**.
  - **Boolean** (&&, ||, !)
  - **bitset** (&,|,~, >>, <<)
    - Shift operators >> and << require **bitset** on the left and a positive **int** on the right.
  - **address** (&, +, -, *)

- **&v** for any variable **v** returns a value of type **address**
- **e1 + e2** is type-correct if **e1** is of type **address** and **e2** is of type **int;** the result is of type **address**
- **e1 - e2** is type-correct if **e1** and **e2** are both of type **address**; the result is of type **int**
- ***e** is type-correct if **e** is of type **address**; the result depends on the form of **e:** if **e** is a variable, then the result is of the same type as that of the variable; otherwise it is undefined

- Assume that variables can be of any type, and **assignment operations** include =, as well as any of the operators list above followed by = (for instance, &=, +=, >>=).
- Assume **TRUE** and **FALSE** are constant values of type Boolean with the usual meanings.
- Assume that **int** and **float** values can be treated as **bitset** values in the contexts where operations require them.
- Also include the **?:** operator for verification of type-correctness: i.e. expressions of the form **e1 ? e2 : e3** where **e1** must evaluate to **Boolean**, **e2** and **e3** must evaluate to the same type whatever that my be.