

CS383 Assignment 4

Instructions:

- Submit all your answers in hard copies.
- Please submit source codes for questions 2 and 5 to alex_wang@126.com.
- This assignment is released on 11/25/2011, and due 11/30/2011.
- Please remember to include your name and student ID on all copies.

1. Consider the following sequence of C/C++ statements. Which of them are syntactically valid but have no reasonable semantic interpretation (assuming the *i* and *j* have been declared as *int* variables)? And explain why.

```
1    j = 0;
2    i = 3 /j;
3    for(i = 1; i > -1; i++)
4        i--;
5    int func(int num){
6        if(num==0) return 1;
7        else return func(num-1); }
```

2. Program design: Using C++, implement the algorithm that take an infix expression as input, output the corresponding prefix and postfix expressions.
 - The input expression and output expression are strings, like *a+b*, *+ab* and *ab+*.
 - The input expression doesn't contain any parentheses.
 - There are only four kinds of operators, '+', '-', '*' and '/'.
3. Define, in any programming languages, a function *f*, such that the evaluation of the expression $(a + f(b)) * (c + (f(b)))$ when performed from left-to-right has a result differs from that obtained by evaluation right-to left.
4. Consider the expression $x+y/2$ in the language C. How many different meanings does this expression have, depending on the types of *x* and *y*?
5. Add C++ style *cin/cout* I/O statements to *Clite₀* by:
 - a. Defining their concrete syntax,
 - b. Defining their abstract syntax,
 - c. Modifying the Lexer and Parser to recognize them, and
 - d. Adding these statements to the *Clite₀* interpreter.

6. Using Table 7.3 (on text book, page 162) as a guide, write a trace table for the Clite program:

```

1  void main() {
2      int i, a, z;
3      i = 5;
4      a = 2;
5      z = 1;
6      while(i>0) {
7          if(i - i/2*2 == 1)
8              z = z * a;
9          i = i / 2;
10         a = a * a; } }

```

7. Suppose $state_1 = \{\langle x, 1 \rangle, \langle y, 2 \rangle, \langle z, 3 \rangle\}$, $state_2 = \{\langle y, 5 \rangle\}$, and $state_3 = \{\langle w, 1 \rangle\}$. What are the results of the following operations? Note: The symbol $\bar{\cup}$ denotes the union

method introduced, and \otimes is natural join operator in Section 8.4.

- $state_1 \bar{\cup} state_2$
 - $state_1 \bar{\cup} state_3$
 - $\phi \bar{\cup} state_2$
 - $state_2 \otimes state_3$
 - $(state_1 - (state_1 \otimes state_3)) \cup state_3$
8. Show all steps in the derivation of the meaning of the following assignment statement when execute in the given state, using the semantic rules given in Section 8.2.3.

$M(z = 2 * x + 3/y - 4, \{\langle x, 6 \rangle, \langle y, -12 \rangle, \langle z, 75 \rangle\})$