

Computer Science 414
Spring 2010
Midterm 2 Practice Problems

1. Give the LR(0) states and transitions, as well as the LR(0) parse table, for the following grammars

(a)

Terminals = {id, ., [,], int }
 Non-Terminals = { S, V }
 Rules = (0) $S \rightarrow V\$$
 = (1) $V \rightarrow \text{id}$
 = (2) $V \rightarrow V \cdot \text{id}$
 = (3) $V \rightarrow V [V]$
 = (4) $V \rightarrow V [\text{int}]$
 Start Symbol = S

(b)

Terminals = {a, (,), \$}
 Non-Terminals = { S', S, A }
 Rules = (0) $S' \rightarrow S\$$
 = (1) $S \rightarrow SA$
 = (2) $S \rightarrow A$
 = (3) $A \rightarrow (S)$
 = (4) $A \rightarrow \text{a}$
 Start Symbol = S'

2. Create a set of LR(0) items and transitions for the following grammar. Show that the grammar is not LR(0). Give the SLR(1) parse table for the grammar.

Terminals = {num, id, [,], \$}
 Non-Terminals = { E', E, V }
 Rules = (0) $E' \rightarrow E\$$
 = (1) $E \rightarrow V$
 = (2) $E \rightarrow \text{num}$
 = (3) $V \rightarrow \text{id}$
 = (4) $V \rightarrow V[E]$
 Start Symbol = E'

3. When creating the Abstract Assembly for a function definition, Do we *need* to store the Stack Pointer on the stack? What about the Frame Pointer and Return Register? Explain.

4. Given the following class definitions, and the local variable declarations in the function foo:

```
class c1 {
    int w;
    boolean z;
}

class c2 {
    c1 y[];
    int z;
}

int foo(int x,y) {
    boolean a;
    boolean b[];
    c1 C;
    c2 D[];

    /* Body of foo */
}
```

Give the abstract assembly tree for each of the following statements, if they appeared in the body of foo:

- (a) `y++;`
- (b) `b[3] = false;`
- (c) `C.w = x + y;`
- (d) `D[x].z--;`
- (e) `D[C.w].y[x].z = x > 3;`
- (f) `while (x < 10) x = x + 3;`