

Computer Science 414
 Spring 2010
 Final Practice Problems
 Solutions

1. For the following grammar, remove left recursion, left-factor, give the first and follow sets for each non-terminal, and give the parse table.

Terminals = {a, b, c, \$}
 Non-Terminals = $\{S', S, A, B, C\}$
 Rules = (0) $S' \rightarrow S\$$
 = (1) $S \rightarrow AB$
 = (2) $A \rightarrow Aab$
 = (3) $A \rightarrow \epsilon$
 = (4) $B \rightarrow BC$
 = (5) $B \rightarrow b$
 = (6) $C \rightarrow ccA$
 = (7) $C \rightarrow cb$
 Start Symbol = S'

2. Give the LR(0) states and transitions, Follow sets for each non-terminal and the SLR(1) parse table for the following grammars.

(a)

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

(b)

Terminals = {a, b, c, \$}
 Non-Terminals = $\{S, S', A, B\}$
 Rules = (0) $S' \rightarrow S\$$
 = (1) $S \rightarrow ABA$
 = (2) $S \rightarrow A$
 = (3) $A \rightarrow aBB$
 = (4) $A \rightarrow bc$
 = (5) $B \rightarrow AAB$
 = (6) $B \rightarrow cb$
 Start Symbol = S'

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

```
class classA {
    boolean x;
    int y;
}

class classB {
    classA w[];
    int z;
}

int foo(int x,int y) {
    boolean w[];
    classA A;
    classB B;

    /* Body of foo */

}
```

Give the abstract assembly tree for each of the following statements, if they appeared in the body of foo. For each abstract assembly tree, tile the tree (by circling tiles on the tree), and then give the actual assembly, noting which code is associated with each tile.

- (a) `y++;`
- (b) `w[y] = false;`
- (c) `B.z = y;`
- (d) `B.w[A.y].x = true;`