CS 164: Fall 1999
Midterm Solutions
Professor L. Rowe

PROBLEM 1.
Answer the following TRUE/FALSE questions:
All non-deterministic finite state automatons can be converted to a deterministic finite state automaton: TRUE
An object-oriented program is easier to read and understand than a conventional procedural program: TRUE
The class of the value assigned to the *this* variable in a method is the class within which the method is declared: FALSE
A Java method signature does not include the return type: TRUE
A *transient* instance variable in Java is not written to persistent storage if the object is output: TRUE
The class of the *Class* object is *Class*: TRUE
A regular expression can specify the set $a^n b^n$ where 0&ltn&lt5, that is {ab, aabb, ..., aaaabbbb}: TRUE
A shift reduce parser performs reductions in the reverse order specified by a left-most derivation: FALSE
The string aabb is a sentential form for the grammar S->ab | aSb: TRUE
A JO99 variable has an l-value and r-value: TRUE
An abstract syntax tree is derived from a parse tree by removing extraneous nodes and restructuring the tree: TRUE
A handle is a simple phrase: TRUE
Some JO99 objects do not have a class: FALSE
The following finite state automation recognizes the laguage specified by the regular expression a^*1a^+: FALSE

```
State Input NextState
0       1       1
0       a       0
1       a       2
2       1       1
2       a       2
Staring state is 0
```

A context free grammar can be used to recongnize any context sensitive language: FALSE

PROBLEM 2.
Given the parse table and grammar:

```
 ____________________________________
|     |  b  |  a  |  $   ||  S  |  A  |
|-------------------------------------|
|  0  |  s3 |  s2 |      ||  1  |  5  |
|  1  |     |     |accept||     |     |
|  2  |  r4 |  s2 |  r4  ||     |  4  |
|  3  |     |     |  r1  ||     |     |
|  4  |  r3 |     |  r3  ||     |     |
```

5	s6					
6		s2			7	
7			r2			

r1: S->b
r2: S->AbA
r3: A->aA
r4: A->a

a) Show a right-most derivation for the input aaba.

S->AbA->Aba->aAba->aaba

b) When parsing the input aaba, how many shifts will be performed?

4

c) Show the parse tree for aaba.

PROBLEM 3.
Given the grammar
S->AcD
A->ab|aAb
D->d|Dd
a) What is the language?

$a^n b^n c d^m$
n, m &gt=1

b) Fill-in the following sets:
FIRST(s) = {a}
FIRST{A} = {a}
FIRST{D} = {d}
c) Fill-in the following sets:
FOLLOW(S) = {$}
FOLLOW{A} = {c, b}
FOLLOW{D} = {d, $}

d) Given the item set I:
S'->.S$
S->.AcD
A->.ab
A->.aAb
which is CLOSURE ({S'->.S$}) for the grammar above, how many edges will exit this state in the canonical LR (0) collection?

3 exit edges

e) Given the item set I in part d, what items are in GOTO (I, a)?
A->a.b
A->a.Ab
A->.ab
A->.aAb

PROBLEM 4.
Given the following transition table:

```
State Input NextState
0       S       1
0       a       3
0       b       2
3       a       3
3       A       4
3       b       2
3       S       5
4       a       3
4       S       7
4       c       6
Starting state is 0
```

a) What are the dimensions in the ACTION table (i.e number of rows and number if columns)?

8 rows
4 columns (a, b, c, $)

b) How many shift entries?

7

c) List the column headers in the GOTO table.

S, A

d) What entries might appear in ACTION tanle rows for states with no exiting edges?

reduce
accept

error (i.e. blank)
