CS 164: Fall 1999
Midterm Solutions
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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^nb^n where $0<n<5$, 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

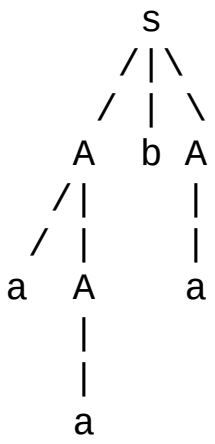
a) Show a right-most derivation for the input aaba.

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 >=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)
