CS164 Midterm #2
Spring 1994
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1. (30 points; 2 points each) Circle T or F to indicate whether each statement is true or false.

T F A sentential form may only contain terminal symbols

T F The following grammar is a regular grammar:
S -> A b | b
A -> a | S A

T F The language specified by the grammar in the previous question is
{ b (ab)* } union { (ab)+ }

T F There is no grammar and input sentence for which the leftmost and rightmost derivations are identical.

T F The following *flex* pattern will match at least the input: 123.45
[^A-Za-z]+"."[^A-Za-z]

T F A DFA may have less states than the number symbols in the input alphabet.

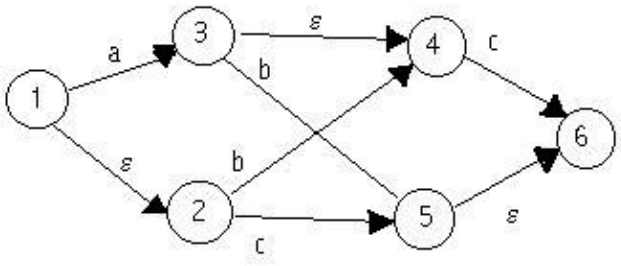
T F A bottom-up parser can generate better error messages than a top-down parser.

T F In *panic mode* error-recovery, the parser exits on the first error it encounters.

T F The address of a variable can never be an rvalue.

T F The language $\{a^n b^n c^n\}$ can be specified by a context free grammar.

T F The following automaton will recognize sentences in the language { a* (b | c) d* }



T F The following is a leftmost derivation
S => ABaD => aBbaD => abbaD => abbac

T F In OO94, the compiler can determine what method to call at compile-time.

T F A relocatable object file contains a symbol table that has an entry for each function not defined in the file that is called from a function defined in the file.

T F A program that is to be run using shared text segments must be re-entrant.

2. (5 possible) Given the following code

```
class Person: Object { string name; int ssan, year_of_birth; };
class Student : Person { int units_completed, year_entered; };
Person myperson;
Student mystudent;
main () {
   myperson = Person.new();
   my student = Student.new();
};
```

Which of the following expressions when executed after the assignment statements in main will return a pointer to an object of type Cobject?

(a) myperson.classof

(b) Cobject

(c) mystudent.classof.parent

(d) Object.classof

(e) none of (a)-(d)

(f) all of (a)-(d)

3. (10 possible) Using the same class definitions as above, what is the type returned by the following expressions?

(a) mystudent.classof.parent.new()

(b) Object.classof.new()

4. (20 possible) The following table traces the contents of the stack of a shift-reduce parser. Upper case letters are non-terminals and lower case letters are terminals.

Bottom					Top
a					
a	b				
a	X				
a	Y				
a	Y	a			
a	Y	a	b		
a	Y	a	X		
a	Y	a	Y		
a	Y	a	Y	c	
a	Y	X			
a	Y				
a	Y	c			
X					

(a) What is the input sentence?

(b) What is the grammar?

5. (20 possible) Consider the following action/goto table for a shift-reduce parser.

state	a	b	$	S	A
0	s4	s6		1	2
1			accept		
2	s4	s6			3
3			r1		
4	s4	s6			5
5	r2	r2	r2		
6	r3	r3	r3		

and the rules:
r1: S -> A A
r2: A -> a A
r3: A -> b

(a) What sequence of actions (e.g., shift to state i, reduce by rule j, accept or error) occur when parsing the input: b b a a? The first action is given to you.

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(b) What is the minimum number of actions that this parser would have to go through when recognizing a valid sentence?

(c) What does it mean if the goto table does not contain a state number when the parser attempts to push a state on the stack after removing the handle during a reduce action?

6. Show an unambiguous grammar for expressions with identifiers (id) and the operators @ and ? where @ is right associative, ? is left associative, and @ is lower precedence than ?.

For example, your grammar should be able to parse the sentence:
id @ id ? id