# CS328, Winter 2001, Test 2

Time 70 min. Use extra paper as needed, but make sure to identify each answer.
YOU MUST RETURN THIS PAGE. NAME_____

1 You have a compiler for C which generates very efficient code but which itself is not very efficient. What would you do to improve that if
a) you doint have the source for the compiler
b) you have the source and its writtent in C

2 There is a table game like this. You have three balls: red, blue, and yellow. They are thrown at a table with a slot. If the come through the slot in this order: red, blue, yellow, you win $5. If they come in the opposite order, you lose $5. If the blue comes first you win $1. If the yellow comes first, you lose $2. Otherwise nothing happens. Design a finite automaton which senses the balls through the slot and pays you money or charges you money if you lose. :
a) what is the alhabet
b) what are the tokens
c) Design the graph

3 Design unambiguous grammar to parse expressions involving +, -, *, / and unary -. Unary minus is strongest, followed by * and /(same precedence, right associative), then +, left associative, then finally -, left associative. Do not use any other operators,a nd use only number tokens.

4 Given the production:
S-> aSAb | Ab
A-> bbb
implement a complete pseudocode for a recursive descent parser. Assume scanner() returns the next token.

5 Give all needed first and follow sets to check if the grammar is LL(1). Is it?:
S -> aA | BB
A -> aaA | empty
B -> bB | Cd
C -> cA | dC

6 In the grammar in your project, show all changes needed to allow functions. A function definition must be before the program token, and functions cannot be nested (exactly like in C). Every function has a return type (no void) and one argument. Function call is like in C, with an expression for the argument and the function call itself is an expression. Examples

```
int fun1(long x)
begin
    /* same as in any block*/
end;
long fun2(int x)
begin
    /** ... */
end;
program xxx(void)
begin
    int x;
    x=fun1(5+2)*10;
end;
```