CS328, Fall 2001, Test 2

Time 50 min. Use extra paper as needed, but make sure to identify each answer.
YOU MUST RETURN THIS PAGE. NAME_____

1 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 they 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 DFA graph

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

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

4 Suppose we want to have functions in our project grammar. A function returns a number, takes no arguments, and its body is a block. Functions are defined exactly like variables in the original grammar except that function name is follow by a block. Show the necessary modifications to your grammar. Is the resulting grammar LL(1)?

5 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;
```