CS328, Winter 1999, Test 2

Open notes / books. Time=75 min. All questions even.

YOU MUST RETURN THIS PAGE. NAME_____

1 Assume the following static program structure, show static chains and display when exactly five ARs are on the stack, assuming procedure A is called first.

```
proc A
begin /* proc A */
   proc B
   begin /* proc B */
      proc C
      begin /* proc C */
         call A
      end /* proc C */
      call C
   end /* proc B */
   proc D
   begin /* proc D */
      call B
   end /* proc D */
   call D
end /* proc A */
```

2 Draw a deterministic FA for an embedded scanner, with one lookahead, which reads from a file containing unsigned integers separated by WS. Your FA should report two kinds of tokens
- **1-byte integer** (unsigned, any integer that can be represented in 1 byte)
- **larger integer** (any integer not representable in 1 byte)

3 Write grammar for a language which is almost as that of our project except for:
- there is no name for the program
- variables are defined as var *varName*, *varName*;
  - variables are optional
  - all variables in a block are listed in the same declaration
  - if var keyword is placed then at least one *varName* must follow (but may be more than one)
  - these variables can be found in any <block> and not just <programBlock>
  - if variables are present in a block, they must precede executable statements
- <stat> can also be a function call (function name followed by single parenthesized expression)
- functions are defined below the program (after end.) one at a time.
  - each function is defined as
  - function *fName*(var *argName*)
    - followed by <block> {just plain <block>, not <programBlock>}

Write only CFG (not the scanner rules) assuming tokes as in the project (plus var keyword and minus int keyword)

Here is an example parsable program:

```
program
begin
   var x, y, z;
   x:=y+10;
   printIt(x+y);
   begin
      var w;
      w:=20;
      printIt(w);
   end;
end.

function printIt(var a)
begin
   writeI(a);
end

function notNeeded(var a)
begin
   a:=0;
end
```