CS328, Fall 2001, Test 1

Time 50 min. 4 questions. Open notes/books. Use extra paper as needed, but make sure
to identify each answer.

YOU MUST RETURN THIS PAGE. NAME___________________________

1 You have the source for a C compiler. Its a wonderful compiler that generated fast
and small target. Super. TO use it you use your old C executable compiler, which was
knows to generate very inefficient target. So you compile the new one.
   a) Show how you do that
   b) What are the potential inefficiencies now?
   c) How would you fix those problems?

2 10) You have an assembler where each instruction takes 1 argument. The instruction
takes 6 bits, and the argument takes 18 bits (total of 3 bytes). Assembly arguments
can be either symbols or immediate values. Data is in 2 bytes. For example, we may
write either or
   Add X
   Add 20
   a) What serious limitations does the language have? Why? Assume that all
      arguments translate to addresses, that is literal pool is needed.
   b) Would a) change if immediately values translated into immediate arguments in the
      machine code? How?
   c) Would a) change if data and program were in different segments? How?

3 10) Show machine code, in dec digits for individual bytes, for this program
   LOAD X
   SUB 10
   STORE Y
   ADD 20
   BOGUS
   JUMP EXIT
   X  CONST 200
   EXIT: STORE X
   STOP
   Y  CONST 100
   STOP takes no arguments and uses 1 byte, other opcodes take 1 byte and each
   argument takes 1 byte. Assume opcodes are Add=10, Load=20, Sub=30, Stop=40,
   Jump=50, Store=60, Bogus=70. Data storage is allocated in the same segment exactly
   where it appears in the program except all data must be even aligned and takes 2
   bytes. Literals are appended at the end and that they are treated like other data.

4 We have a washing machine. The machine takes dimes and quarters only. It needs 40
cents for operation. The user puts money until the machine detects 40 cents, in which
case it starts and also if necessary it gives change in nickels. We want a FA to handle
the task.
   a) what is the alphabet
b) what are the tokens?
c) design the FA as a graph, indicating which states do recognize which tokens