

CS328, Winter 2001, Test 1

Time 70 min. 6 questions. Open notes/books. Use extra paper as needed, but make sure to identify each answer.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 5) What are the major trade-offs between compiler and interpreter. Address as many important issues as you think of.
- 2 10) You have an assembler where each instruction takes 1 argument. The instruction takes 4 bits, and the argument takes 12 bits (total of 2 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) the code and data are in the same segment (one base register) and machine code arguments are ALL addresses. List all important limitations/constraints (code size, amount of data, data size, and whatever you can think of).
 - b) what would be different in a) if we allowed the machine code to have both addresses and immediate values?
 - c) redo a) when the code and data are in different segments.
- 3 10) Show machine code, in dec digits for individual bytes, for
LOAD Y
SUB 3
ADD X
ADD 20
JUMP EXIT
X CONST 100
EXIT: STOP
Y CONST 200
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. Data storage is allocated as 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 10) Design an automaton to for alphabet $\{0,1\}$ and to recognize if a string is 0^n1^n , $n \leq 2$.
- 5 10) Can you design a FA to recognize $0^n1^n0^{2n}$, $n \leq 1000$. You must defend your answer either by giving the right arguments or by designing the automaton.

- 6 15) We have a washing machine. The machine takes dimes and quarters only. It needs 50 cents for operation. The user puts money until the machine detects 50 cents, in which case it starts and also if necessary it gives change. 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
 - d) represent the FA in a table