Ph.D. Qualifying Exam (Fall 2002)
Automata and Formal Languages
Answer ALL questions

Question 1.

(a) (15%)

A Turing machine uses an infinite tape as its unlimited memory. In contrast, our computers are limited in memory. Discuss whether Turing machine is an accurate model of a general purpose computer.

(b) (15%)

In many textbooks, the 'Halting Problem' is formulated using Turing machines. Discuss whether the halting problem for a computer with 256MB RAM and 20GB hard disk is decidable.

Question 2. (35%)

Is $\{a^i b^j c^i d^j \mid i \geq 1 \text{ and } j \geq 1\}$ context free? Give a proof for your answer.

Question 3. (35%)

Construct a DFA for the regular expression $(0 + 0\ 1^*\ 0\ 1^*\ 0)^*$.