CSE 322 Winter 2006

<u>Homework Assignment # 4</u>

Due Date: **<u>Wednesday, February 8</u>** (at the *beginning* of class)

1. (30 points) Give regular expressions that generate the following languages. In all cases, the alphabet is $\Sigma = \{0,1\}$.
   a. $\{w \mid w$ contains the substring 10$\}$
   b. $\{w \mid w$ contains the substring 10 and ends in 0$\}$
   c. the set of all strings except the empty string and the string 0
   d. $\{w \mid w$ contains an odd number of 0's <u>or</u> at least two 1's$\}$
   e. $\{w \mid w$ contains an odd number of 0's <u>and</u> at least two 1's$\}$
   f. $\{w \mid w$ contains a 1 among the last six positions$\}$ (note: if length of w is less than 6, then w should contain a 1 at any position)

2. (15 points) <u>Describe the language</u> accepted by the following regular expression using the $\{w \mid \ldots.\}$ notation and then <u>convert the regular expression to an NFA</u> using the procedure discussed in class (see lecture slides and pages 66-67 in either edition of the text): $0((0 \cup 1)(0 \cup 1))^* \cup (0 \cup 1)^*1 \cup \varepsilon$

3. (15 points) Convert the DFA in Exercise 1.21 (b) in the textbook (2nd edition) (Exercise 1.16 (b) in the 1st edition) to a regular expression using the GNFA procedure discussed in class (see lecture slides and pages 69-73 in either edition of the text).

4. (30 points) Show that the following languages over $\Sigma = \{0,1\}$ are <u>not regular</u>:
   a. $\{1^n w \mid w \in \Sigma^*,\ n \geq 0$, and the length of w is at most n$\}$
   b. $\{1^i 0 1^j 0 1^k \mid i, j \geq 1$ and $k = i + j\}$
   c. $\{w \mid w \in \Sigma^*$ and $w = w^R\}$ where R denotes the string reversal operation.

5. (10 points) Problem 1.40 (b) in the 2nd edition of the textbook (Problem 1.32 (b) in the 1st edition).