CS 520 – Problem Set II   Name ______________________

1. Let = {a,b}. Define in set notation the following languages

   a. $^{+}$ - $^{i}_{i=3\ \infty}$ =

   b. $^{+}$ $^{+}$ =

   c. ^{2} - {aa,ab,ba} =

   d. $\overline{\ ^{+}}$ =

2. a. Argue as to *why* it is possible to design an FA to accept the following language

   L = { w {a,b,c}*| ($n_a(w)$ + $n_b(w)$) mod 3 > $n_c(w)$ mod 4 }.

   b. How many states would this dfa have? Support your answer.

3. For each of the following languages, prove that it is a regular language by construction or cogent argument **or** prove that it is not, by careful application of the pumping lemma. You may also use any results we obtained in class.

   a. L = { $a^k b^l c^m$ | k+l+m < **n, n** }

   b. L = { $a^n b^n c^n d^n$ | n 0 }

4. For the following languages, prove whether they are context free. Assume = { a,b }.

a. $L_1 = \{ a^n b^m \mid n \quad 2m \}$

b. $L_2 = \{ ww^r ww^r \mid w \quad ^* \}$

5. Consider the following CFG. Transform this grammar into Chomsky Normal Form. Be sure to remove lambda and unit productions before proceeding.

S abAB
A bAB |
B BAa | A |

6. Describe the strategy for building a Turing machine to accept the following language

$L = \{ w \quad a^i \mid i = 2^k$, where k is a nonnegative integer }