Name:

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CSCE 428/828 Homework 1

**1.35**. Let  be the same as in Problem 1.33 (). Consider the top and bottom rows to be strings of 0s and 1s, and let

E={  | the bottom row of ω is the reverse of the top row of ω}.

Show that (E) is not regular.

**1.46c.** Prove that the following language is not regular. You may use the pumping lemma and the closure of the regular languages under union, intersection, and complement.

{ | is not a palindrome}

**1.53.** Let () and

ADD = {x=y+z | x,y,z are binary integers, and x is the sum of y and z }.

Show that *ADD* is not regular.

**1.55.** The pumping lemma says that every regular language has a pumping length p, such that every string in the language can be pumped if it has length p or more. If p is a pumping length for language A. so is any length p'>=p. The ***minimum pumping length*** for A is the smallest p that is a pumping length for A. For example, if A=01\*, the minimum pumping length is 2. The reason is that the string s=0 is in A and has length 1 yet s cannot be pumped; but any string in A of length 2 or more contains a 1 and hence can be pumped by dividing it so that x=0, y=1, and z is the rest. For each of the following languages, give the minimum pumping length and justify your answer.

**c.** 

**e. **

**h.** 

1**.62.** let. For each k>=1, let  be the language consisting of all strings that have at least one a among the last k symbols. Thus . Describe a **DFA** with at most k+1 states that recognizes  in terms of both a state diagram and a formal description.

**1.63a.** Let A be an infinite regular language. Prove that A can be split into two infinite disjoint regular subsets.

**1.71a.** Let

 Let  and  Show that A is regular.

**1.72b.** Let M1 and M2 be **DFA**s that have k1 and k2 states, respectively, and then let .

Show that if (), the  excludes some string, where .