CS381 Fall 2001 – Homework 6
Prof Shai Ben-David

DUE: Monday, November 12, 9:05 am

NOTE: EVERY claim you make should be supported by an explanation or a proof

1. Describe an algorithm that on input -a DFA, M, outputs the answer to:

   "Is L(M) infinite?"

   (HINT: As a first step prove that L(M) is infinite if and only if

   $L(M) \cap \{w : n \leq |w| \leq 2n\} \neq \emptyset$ (where n is the number of states in M).

2. Construct Turing machines that compute the following languages:

   (a) $\{a^{2^n} : n \in \mathbb{N}\}$

   (b) $\{a^n b^k c^{n+k} : n, k \in \mathbb{N}\}$

   (c) $\{w \in \{0,1\}^* : |w|$ is even and there exists $i \leq \frac{|w|}{2}$ such that for all

   $j < i$, $a_j = a_{\frac{|w|}{2}+j}$ and $a_i = 1$ and $a_{\frac{|w|}{2}+i} = 0\}$ (where a_i is the i^{th} bit of w).