COT 5310 – Fall 2001 – Home Assignment on Turing Machines [H3]

This homework will be collected in class on Tuesday, October 23.

1. Rewrite the formal definition of a Turing Machine and the relation $\vdash$ .
   (see H&U, pp 148-149, or H&M&U, pp 319-320).

2. For the Turing Machine considered in class that accepts strings of the form $0^n1^n$ (H&M&U p.324),
   list the ID’s for the cases when the input tape contains:
   (a) 00
   (b) 000111
   (c) 00111

3. Give the transition diagram for a Turing Machine that accepts the language
   \[ L = \{0^n1^n0^n \mid n \geq 1 \} . \]

4. Give the transition diagram for a Turing Machine that accepts the language
   \[ L = \{ww^R \mid w \text{ a binary string} \} , \]
   where $w^R = x_nx_{n-1}\ldots x_2x_1$, for $w = x_1x_2\ldots x_{n-1}x_n$.

5. Design a Turing Machine that takes as input a number $N$ and adds 1 to it. More specifically, the tape
   initially contains a $|$ in state $q_0$, followed by the binary description of $N$. Your Turing Machine must
   halt with $N + 1$ in binary. So for example, $q_0|10011 \vdash * \ 10100$, and $q_0|11111 \vdash * \ 100000$.
   (a) Give the transitions of your Turing Machine.
   (b) Show the sequence of ID’s of your Turing Machine when the input is $111$. 
