CS 311 Homework 8

due 16:30, Thursday, 18^{th} November 2010

Run this homework in JFLAP against the supplied data. If you want to use the *xTuring-Machine* simulator to help you debug, you may do so, but please hand in only the JFLAP output.

For each question, hand in a JFLAP picture of your Turing machine (use File > Save Image As ...), and a screenshot of the JFLAP "Multiple Run (Transducer)" dialog showing that your machine works on the given data.

You may find it useful to work on this homework with a partner. If you do so for Questions 1 and 2, attempt the final question on your own. Hand in your own copy of the joint work, identify it as joint work, and name your partner.

Question 1. [20 pts.]

Design, in JFLAP, a Turing machine that takes as input a tape containing a non-empty) series of 0s and 1s, terminated by a blank. The Turing machine head is initially positioned on the leftmost digit. The end state should be a tape containing the reverse of the initial sequence. The final position of the head does not matter.

Run your machine (using Input > Multiple Run (Transducer)) and check that it produces the correct output as follows.

Input	Output	Result
0	0	Accept
1	1	Accept
10	01	Accept
01	10	Accept
11	11	Accept
101	101	Accept
011	110	Accept
110	011	Accept
001	100	Accept
1100	0011	Accept
0101	1010	Accept

Question 2. [20 pts.]

Design, in JFLAP, a Turing machine that takes as input a tape containing a series of n 1s, where $n \geq 0$, terminated by an = sign. The Turing machine head is initially positioned on the leftmost 1. The end state should be a tape containing the input, followed by the reverse of the sequence of 0s and 1s that represents n in binary.

Run your machine (using Input > Multiple Run (Transducer)) and check that it produces the correct output as follows.

Input	Output	Result
1=	1=1	Accept
11=	11=01	Accept
111=	111=11	Accept
1111=	1111=001	Accept
11111=	11111=101	Accept
111111=	111111=011	Accept
1111111=	1111111=111	Accept
11111111=	11111111=0001	Accept

Question 3. [20 pts.]

Combine the machines that you designed for questions 1 and 2 to produce a machine that converts unary to binary.

Run your machine (using Input > Multiple Run (Transducer)) and check that it produces the correct output as follows.

Input	Output	Result
1=	1=1	Accept
11=	11=10	Accept
111=	111=11	Accept
1111=	1111=100	Accept
11111=	11111=101	Accept
111111=	111111=110	Accept
1111111=	1111111=111	Accept
11111111=	11111111=1000	Accept