Assignment 2: Architecture-Aware Efficient Implementations
Total: 100 points

Received: 9/22/2008

Due: 4:00 p.m., 10/1/2008

1. [20] Suppose that you are asked to write a program that decides if an input linked list L is circular or not.   The input linked list L may have an infinite length.

    ①   [5] Describe your algorithm assuming that you can use *as much memory as you wish.*

    ②   [15] Describe your algorithm assuming that you have to use *less than a fixed amount of memory*.

2. [80] In this problem, you will implement an efficient Huffman decoder for ARM processors.

    ①   [5] Following the TA's announcement (available from the course homepage), install the SimpleScalar/ARM simulator on your Linux machine.   Using the machine configuration specified in the TA announcement, run the test program, which is also available from the course homepage, on your simulator.   What is the total number of executed CPU cycles (i.e., *sim_cycle* value in your run)?

    ②   [75] Using the same SimpleARM configuration you have used above, implement a Huffman decoder for input bit streams that were encoded using the Huffman codewords listed below.   The implementation goal is to minimize the execution time.

Symbol (32-bit integer values)	Codeword
512	11
256	10
1	011
0	010
4	0011
32	0010
64	00011
89	000011
333444	0000011
13579	0000001
568931	00000001
12345	000000001
78903	0000000001
5689	00000000001
444777	000000000001
2468	0000000000001
3579	00000000000001
112233	000000000000001

Assuming that your implementation is correct, we will rate your score as follows: The fastest program will get *75* points.   Unless your program runs the fastest, your score will be computed as follows:

$Score_{your\_prog} = ceiling(\ (Execution\ Time_{fastest}\ /\ Execution\ Time_{your\ prog})\ x\ \textbf{75}\ )$