

CISC 260 Machine Organization and Assembly Language (Spring 2019)

Assignment # 5 (Due: April 23, 2019)

Problem 1 [15 pts]. Show the IEEE 754 binary representation for the following fraction numbers in single precision. Give your answer in hexadecimal. State if each number can be represented exactly.

- a. -37.625
- b. 0.4

Problem 2 [15 pts]. What decimal number does the following bit pattern represent if it is a single precision floating-point number using the IEEE 754 standard?

- a. $0xC0120000$
- b. $0xD1B40000$

Problem 3 [15 pts]. A single precision IEEE 754 number is stored in memory at address X. Write a sequence of ARM instructions to multiply the number at X by 32 and store the result back at X. You must accomplish this without using any floating-point instructions (you may ignore overflow or underflow). Note: this is a paper-pencil problem.

Problem 4 [15 pts]. It is known that $(x+y)(x-y) = x^2 - y^2$. The following C code is used to calculate the

```
float x=12.1234;
float y= 12.1111;
float z1 = x*x - y*y;
float z2 = (x+y)*(x-y);
printf("z1 = %f\n", z1);
printf("z2 = %f\n", z2);
```

Run the program and report the results. If the results are not what is expected, explain why? Which result, z1 or z2, is more accurate and why?

Problem 5 [40 points]: Implement in ARM7 assembly language a linked list for sorting. In the main function, open a file to read a sequence of unsorted integers. For the first input integer, create a root node (8 bytes), holding the integer and one empty pointer. For each of the following input integers, build a link (call it X) containing the number and insert it to the linked list such that for any link with smaller integer should go before X and any link with an integer of bigger or equal value should go after X. After all integers are inserted, the program would traverse the linked list and print out the sorted integers separated by space onto the screen. (See next page)

Specification: you should write Insert as a recursive function.

data	Null or a Pointer to the next node
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Submission: For problem 5, a plain text file containing your assembly code should be submitted on Canvas.