Assignment 6

Due December 4, 17:00

NOTE: Late submissions will **NOT** be accepted. Please submit a single PDF file with your answers via the **ECE 355 Brightspace** webpage.

1. [10 points]

(a) Show decimal number **–128.625** in the 32-bit IEEE-754 floating-point format.

(b) Show 32-bit IEEE-754 number **0 00000000 11000000000000000000000** in the decimal format.

(c) Show 32-bit IEEE-754 number **0 01111111 00000000000000000000000** in the decimal format.

(d) Given two 32-bit IEEE-754 floating-point numbers **X** and **Y** below, calculate (in the binary format) **Z = X–Y**, and then convert **Z** to the decimal format:

X = **0 01111001 00000000000000000000000**,

Y = **1 01111100 11100000000000000000000**.

2. [5 points] Consider a pipelined datapath consisting of five stages:

F – fetch the instruction from the memory,

D – decode the instruction and read the source register(s),

C – execute the ALU operation specified by the instruction,

M – execute the memory operation specified by the instruction,

W – write the result in the destination register.

Identify data hazards in the code below and insert **NOP** instructions where necessary.

```
MOV   R2, R0          // R0 = R2
ADD   #4, R4, R4      // R4 = R4 + 4
ADD   R0, R2, R1      // R1 = R0 + R2
MOV   R4, R2          // R2 = R4
MOV   (R4), R6        // R6 = MEMORY[R4]
MOV   R3, (R1)        // MEMORY[R1] = R3
ADD   R0, R2, R3      // R3 = R0 + R2
ADD   R4, R6, R5      // R5 = R4 + R6
ADD   R2, R4, R1      // R1 = R2 + R4
```

3. [2 points] Solve Problem **12.8** from the textbook.

4. [8 points] Solve Problem **12.7** from the textbook. **Hint:** Declare the shared counter variable as "`volatile int thread_id_counter`", initialize it to 0 in `main()`, and check it by each thread as follows: "`while (thread_id_counter != my_id);`". Each thread must increment `thread_id_counter` after updating global `dot_product`.