

Solutions last updated: Friday, March 28, 2025

PRINT Your Name: _____

PRINT Your Student ID: _____

You have 170 minutes. There are 1 questions of varying credit. (8 points total)

Question:	1	Total
Points:	8	8

For questions with **circular bubbles**, you may select only one choice.

- ☐ Unselected option (Completely unfilled)
- ☒ Don't do this (it will be graded as incorrect)
- ☒ Only one selected option (completely filled)

For questions with **square checkboxes**, you may select one or more choices.

- ☐ You can select
- ☐ multiple squares
- ☒ (Don't do this)

Anything you write outside the answer boxes or you ~~cross-out~~ will not be graded. If you write multiple answers, your answer is ambiguous, or the bubble/checkbox is not entirely filled in, we will grade the worst interpretation. For coding questions with blanks, you may write at most one statement per blank and you may not use more blanks than provided.

If an answer requires hex input, you must only use capitalized letters (**0xDEADBEEF** instead of **0xdeadbeef**). For hex and binary, please include prefixes in your answers unless otherwise specified, and do not truncate any leading 0's. For all other bases, do not add any prefixes or suffixes.

Write the statement below in the same handwriting you will use on the rest of the exam.

I have neither given nor received help on this exam (or quiz), and have rejected any attempt to cheat; if these answers are not my own work, I may be deducted up to **0x0123 4567 89AB CDEF** points.

SIGN your name: _____

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The exam begins on the next page.

Q1 Potpourri

(8 points)

Q1.1 (3 points) Consider an 8-bit floating point format that follows the IEEE-754 standard, with 1 sign bit, 4 exponent bits (with a standard bias of -7), and 3 mantissa bits.

What is the minimum distance between any two denormalized numbers in this floating point format? Express your answer as a power of 2.

3

Q1.2 (3 points) Consider the following multi-threaded code block.

```
1 int32_t a = 0;
2 int32_t b = 2;
3
4 #pragma omp parallel {
5     while (b > 0) {
6         a = a + b;
7         #pragma omp critical {
8             b = b - 1;
9         }
10    }
11 }
```

If we run this code with two threads, what is the largest possible value of **a** after both threads finish execution?

Note that the expression **a = a + b** is equivalent to four instructions: load the value of **a**, load the value of **b**, sum **a** and **b**, and then store the result in **a**.

3

Q1.3 (2 points) Select all true statements about the manager-worker framework.

- ☒ If one program crashes, the others keep going.
- ☒ Programs communicate by sending messages between each other.
- ☒ The manager-worker framework splits a problem into independent subtasks and tries to minimize communication between programs.
- ☐ The manager is able to assign a task to a worker before the worker is ready.
- ☐ None of the above