CS101
Fall 2024

Alan Turing
Final

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PRINT Your Name: _____

PRINT Your Student ID: _____

PRINT the Name and Student ID of the person to your left: _____

PRINT the Name and Student ID of the person to your right: _____

PRINT the Name and Student ID of the person in front of you: _____

PRINT the Name and Student ID of the person behind you: _____

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 (`0xBOBACAFE` instead of `0xb0bacafe`). 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.

> As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others. I will follow the rules of this exam.

Acknowledge that you have read and agree to the honor code above and sign your name below:

_____

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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.
- ■ The manager-worker framework splits a problem into independent subtasks and tries to minimize communication between programs.
- ○ None of the above
- ■ Programs communicate by sending messages between each other.
- ☐ The manager is able to assign a task to a worker before the worker is ready.