

# CSCI 2321 (Principles of Computer Design), Spring 2002

## Review for Exam 2

### 1 Format of the exam

The exam will be in class April 12. You will have 50 minutes. You may use your textbook and any notes or papers you care to bring, but you may not use other books, *a calculator or computer*, or each other's papers.

Most questions will be similar in form to those in the homework assignments and daily end-of-lecture quizzes. The focus will be on material not covered in the previous exam, but the cumulative nature of the subject makes it difficult if not impossible to completely exclude earlier material (e.g., how can we talk about implementing a MIPS `add` instruction if we don't remember what one looks like?).

### 2 Lecture topics to review

You are responsible for all material covered in class, but the following is a summary of topics I consider most important.

- Computer arithmetic (on integers): addition, subtraction, multiplication and division (basic ideas only, not details of algorithms), overflow.
- MIPS instructions for manipulating bits (`sll`, `srl`, `and`, `or`, etc.).
- AND and OR gates and inverters, and how to use them to implement Boolean functions.
- Design of an ALU.
- Floating-point representation and arithmetic (basic ideas only, not details).
- Combinational-logic blocks versus state elements.
- State elements and the clock cycle.
- Design of a datapath for a single-cycle implementation of our selected subset of MIPS instructions: what elements are needed, how to connect them, what control signals are needed.
- Generating control signals for our single-cycle implementation: what elements we need (two combinational-logic blocks), their inputs and outputs, how outputs depend on inputs (expressed via truth tables and/or Boolean functions).
- How the completed single-cycle implementation (datapath and control) executes example instructions.
- Why a single-cycle implementation isn't really practical.

### 3 Reading to review

You should have read (or at least skimmed) all of chapter 4 (except sections 9, 12, and 13) sections 1 through 3 of chapter 5, and sections 1 through 5 of appendix B. You might also find it useful to skim section 2 of appendix C. The following is a list of sections and figures to read more carefully and/or review.

- In chapter 4: section 4.3, section 4.4, figures 4.17 and 4.18, figures 4.31 and 4.32, figures 4.40 and 4.41, section 4.10 (first two pages), and section 4.11. (For the multiplication and division algorithms, you don't need to memorize details, just see in general how the sketched hardware design relates to the algorithm.)
- In chapter 5: section 5.1, section 5.2 (including all figures), section 5.3 (including all figures, but okay to skim material on performance).
- In appendix B: sections B.1 through B.5 (except pages B-10 through B-17 and B-27 through B-35).
- In appendix C: section C.2.