CDA3101 Test 1 Topics List

Be comfortable with all of homework 1 and project 1!

Lecture 1: Introduction

• Classes of computers.
  o PC, Servers, Embedded.
  o Design considerations and domains of each.
• Great Architecture Ideas.
• What is abstraction and what are the benefits?
• The five classic components of the computer.
• Steps of program execution.
• What is an ISA?
• Latency and throughput
  o Definitions
  o Know how simple changes to the computer affect these metrics.
• Performance equation. Be able to compare the performance of two machines.
• Processor concepts: clock cycles, clock period (clock rate), CPI.
• Classic CPU performance equation.
• Amdahl’s Law.
• The power wall and the switch from single to multi-core processors.

Lecture 2: Assembly

• Advantages of high-level languages.
• RISC vs CISC
  o MIPS is a RISC ISA
• Four ISA Design principles and examples of each in practice.
• MIPS instructions
  o Know meaning of all instructions covered in slides.
  o Know how to encode/decode instructions.
  o Know three formats and the instructions of each.
  o Understand what fields are for (opcode, rs, rt, shamt, etc.)
  o All addressing modes.
  o Be able to translate C <-> Mips.
  o MIPS is word (4 byte) aligned.
Lecture 3: Translation

- Four areas of memory in a process.
- 5 stages of the translation process.
  - Be able to describe each.
  - Be able to indicate the stage during which an action takes place.

Lecture 4: Logic Design

- Truth tables.
- Boolean algebra with AND, OR, and NOT.
- You do not need to memorize identities and laws.
- Be able to derive a logic equation.
  - From text (slide 10).
  - From truth table.
  - From hardware diagram.
- Know AND, OR, NOT logic gate diagrams.
- Understand how multiplexors work.
- What is two-level logic and why is it desirable?
- Be able to write a logic equation in canonical form from a truth table.
- Programmable logic arrays – what they are and how they work.
- ALU – what its role is in the processor and inputs/outputs associated with it.
- Physical realization of a clock.

Lecture 5: Single-Cycle Datapath and Control

- Roles of datapath and control.
- Understand the role of the state elements and the input/output associated with them.
  - Instruction Memory
  - PC
  - PC adder
  - ALU
  - Register file.
  - Data memory element
  - Sign-extending element
- Understand the datapath for each of the simple MIPS instructions we went over in class.
- Effect of asserting and deasserting control lines covered in class.
- Advantages and disadvantages of single-cycle approach.