

# GEORGIA INSTITUTE OF TECHNOLOGY

College of Computing

## CS/EE6760 — Parallel Computer Architecture I

Fall 1998

---

CS/EE6760  
Homework 1

Issued: October 1, 1998  
Due: October 8, 1998

---

**Purpose:** This homework covers instruction sets and memory systems as a warm-up for the first project.

**Reading:** H&P Chapter 5 and [Dennis65] (*problems 1, 2*)  
H&P Chapter 1 and [Wood95] (*problem 3*)  
H&P Chapter 2 and [Patterson85] (*culture: RISC revolution*)

**Problems:**

1. Cache basics.
2. Virtual memory.
3. Amdahl's law.

**Problem 1:** Cache Basics

**A:** Problem 5.1 in the book. Project 1 will examine cache design extensively, so this problem serves only as a quick warmup.

**Problem 2:** Virtual Memory

The book describes virtual memory with the view of it as an extension of the memory hierarchy. The [Dennis65] paper discusses memory mapping from the perspective of its usefulness to multiprogramming.

**A:** Dennis describes both paging and segmentation as desirable hardware support for a multiprogrammed computer system. 30+ years later, paging is mainstream but segmentation is not (it exists in some processors, notably x86 but goes unused). What is the specific problem that segmentation hardware addresses (distinct from the paging hardware)? Answer with a paragraph.

**B:** Problem 5.20 in the book. Write two paragraphs: one explaining why designers *should* drop virtual memory in future machines and another explaining why we should *not*.

**Problem 3:** Amdahl's Law

**A:** Problem 1.1 in the book

**B:** Problem 1.14 in the book.