

# **SCSR2033, SCR2033, SCR1043: Homework #1**

Due on Saturday, October 25, 2014

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**Student**

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## **Problem 1**

What is the difference between architecture and organization? Elaborate your answer.

## **Problem 2**

Explain what is structure?

## **Problem 3**

What is stored program computer?

## **Problem 4**

What are the four main components of any general purpose computer based on Von Neumann architecture?

## **Problem 5**

What are the differences between transistor and vacuum based computers?

## **Problem 6**

At the integrated circuit level, what are the 3 principal constituents of a computer system?

## **Problem 7**

The fastest MAC we have runs at a clock speed of 2.2 GHz. If you want the fastest machine, you should buy 2.4 GHz Intel Pentium 4. What would you say to help this customer based on your designing and understanding performance issues? Relate your answers to the performance gap between CPU, memory and I/O as discussed in class

## **Problem 8**

Illustrate multiple cores approach using a diagram. Why was this approach taken by computer designers and architects?

## Problem 9

(a) We wish to compare the performance of 2 different computers: M1 and M2. The following measurements have been made on these computers:

Which computer is faster for each program and how many times as fast is it?

Table 1: Measurements of computational time of M1 and M2

Program	Time on M1	Time on M2
1	2.0 seconds	1.5 seconds
2	5.0 seconds	10.0 seconds

(b) The following additional measurements were made:

Find the instruction execution rate (instruction per second) for each computer when running program 1

Table 2: Measurements of computational time of M1 and M2

Program	Instructions executed on M1	Instructions executed on M2
1	$5 \times 10^9$ seconds	$6 \times 10^9$ seconds

## Problem 10

Suppose you wish to run a program P with  $7.5 \times 10^9$  instructions on a 5 GHz machine with a CPI of 0.8.

(a) What is the expected CPU time?

(b) When you run P, it takes 3 seconds of wall clock time to complete. What is the percentage of the CPU time P received?

## Problem 11

Suppose we have 2 implementation of the same instruction set architecture. Computer X has a clock cycle time of 500 ps and a CPI of 5 for some program, and computer Y has a clock cycle of 1000 ps and a CPI of 2 for the same program. Which computer is faster for this program and by how much?

## Problem 12

Our favorite program runs in 20 seconds on computer P, which has 8 GHz clock. We are trying to help a computer designer build computer Q that will run this program in 5 seconds. The designer has determined that the substantial increase in the clock rate is possible, but this will affect the rest of the CPU design, causing computer Q to require 1.5 times as many clock cycles as computer P for this program. What clock rate should we tell the designer to target?