Pierce College

CSIT 546

Midterm Examination
15 April 2014

Name:_________KEY_________________________________
1. Classical Computer Systems

a. Describe the major components of the CPU in a classical, i.e., von Neumann, machine. (10 points)

   - PC: program counter
   - IR: instruction register
   - MAR: memory address register
   - MBR: memory buffer register
   - I/O AR: I/O address register
   - I/O BR: I/O buffer register
   - PSW: Program Status Word

b. Describe the machine cycle of a von Neumann machine, including the retrieval of the data items. As part of this description, draw the Instruction Cycle State Diagram including Interrupt Processing. (10 points)
2. For each of the following Cache Memory Systems, describe the advantages & disadvantages of the particular system

a. Direct Mapped Cache System
   i. Advantages
      Easy implementation
      Simple circuitry
      Fast operation
   ii. Disadvantages
      Each block maps to only one cache line (inflexible)

b. Associative Mapped Cache System
   i. Advantages
      Blocks map to any cache line
      Less cache misses
   ii. Disadvantages
      Complexity of circuitry
      Longer access time – needs to check all tags

c. Set-Associative Mapped Cache System
   i. Advantages
      Can be used as direct mapped cache or associative mapped cache
      Block can be mapped to any line is a set
      Flexible
      Less cache misses
   ii. Disadvantages
      More complexity of circuitry than simple associative mapped cache
      Somewhat longer access time – needs to check all tags in the set
      Complicated caching algorithm
3. Limiting the discussion to DRAM, i.e., Dynamic RAM, and SRAM, i.e., Static RAM, i.e., cells, which one satisfies which criteria:

   (20 points)

   a. Inexpensive

      DRAM

      i. Why?

      Fewer transistors (1 vs 6)

   b. Compact

      DRAM

   c. Faster

      SRAM

   d. Digital Device

      SRAM

   e. Analog Device

      DRAM

   f. Used to construct Main Memory chips

      DRAM

   g. Used to construct Cache Memory chips

      SRAM
4. Discuss the major differences between SDRAM and DRAM memory.

**Dynamic RAM and Synchronous DRAM**

(10 points)

**DRAM**
Asynchronous using system clock & standard bus with wait states

**SDRAM**
Synchronous using external clock
running at processor-memory bus speed without wait states

Operations performed on blocks of chips in parallel, i.e., simultaneously
5. Current Technology Systems

a. What is the operational difference between a 4-Core chip using Point to Point Interconnect with PCI Express and a System that uses four Processors? (10 points)

The 4-Core chip using Point to Point Interconnect with PCI Express is most useful when used for tightly coupled problems since the Point to Point Interconnect facilitates the fast communication between cores.

A system which consists of four processors connected by a fast bus works best for problems which are essentially independent but require fast simultaneous computation.

b. How does an ARM chip and an Intel chip differ from one another? (10 points)

The ARM chip was designed to be used for embedded systems while the Intel chip was specifically designed to be used as a general processor.