

Name:

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**COE 301/ICS 233, Term 172**

**Computer Architecture & Assembly Language**

**Quiz# 1 Solution**

Date: Thursday, Feb. 1, 2017

**Q1.** Fill the blanks in the following questions:

- (1) Two advantages of programming in assembly language are space and time efficiency and accessibility to system hardware.
  
- (2) Two advantages of programming in high-level language are programs are portable and program development and maintenance are faster.
  
- (3) With a 24-bit address bus and 32-bit data bus, the maximum memory size (assuming byte addressable memory) that can be accessed by a processor is  $2^{24}=16$  MB and the maximum number of bytes that can be read or written in a single cycle is  $32/8=4$ .
  
- (4) The advantage of static RAM over dynamic RAM is that it is faster but the disadvantage is that it is less dense and more expensive.
  
- (5) Accessing data from random access memory is slower than accessing it from cache memory but faster than accessing it from hard disk memory.
  
- (6) The bandwidth mismatch between the speed of processor and the speed of main-memory is alleviated by using cache memory.

(7) The instruction set architecture (ISA) is considered as an interface between software and hardware and consists of the instruction set, programmer accessible registers and memory.

(8) Given a magnetic disk with the following properties:

- Time of one rotation is 8 ms
- Average seek = 8 ms, Sector = 512 bytes, Track = 200 sectors

The average time to access a block of 100 consecutive sectors is  
 $8 \text{ ms} + 0.5 * 8 \text{ ms} + 100/200 * 8 \text{ ms} = 16 \text{ ms}.$

**Q2.** Briefly describe the main functionality of the program counter register (PC), the instruction register (IR), and the fetch-execute process in a computer.

Program counter register: is the register in the CPU that holds the address for the next instruction to be fetched from memory.

Instruction register: is the register in the CPU that stores the machine language instructions, temporarily, after the instructions are fetched from memory.

Fetch-execute process: In the fetch-execute process, the CPU takes the address stored in the program counter and reads from memory the instruction stored at that address. The instruction read from memory is stored in the instruction register. The program counter is then incremented to point to the next instruction to be fetched from memory. Then, the CPU executes the instruction stored in the instruction register. Execution of the instruction includes decoding the instruction, getting the operands, performing the instruction operation and storing the result back. The process is performed repeatedly until the machine is halted.