EE 2004
Week 2 Tutorial

1. State the three main parts of a digital computer.

2. List the three components inside a CPU.

3. List the three bus types present in every CPU.

4. Describe the sequence of signals that occurs on the address bus, the control bus, and the data bus when a microcomputer fetches an instruction.

5. Instruction processing consists of two steps: fetching and execution. Answer the following two questions:

   (a) List the three steps that are performed during execution.
   (b) Suppose that the program and data memories are separated as in Harvard architecture. For the fetching stage, which memory does the CPU need access? How about the execution stage?

6. Answer the following questions:
   (a) How many nibbles are 16 bits?
   (b) How many bytes are 32 bits?
   (c) If a word is defined as 16 bits, how many words is a 64-bit data item?
   (d) What is the exact value (in decimal) of 1 meg (M)?
   (e) How many K is 1 meg (M)?
   (f) What is the value (in decimal) of 1 giga (G)?
   (g) How many K is 1 giga (G)?
   (h) How many meg is 1 giga (G)?
   (i) If a given computer has a total of 8 megabytes of memory, how many bytes (in decimal) is this? How many kilobytes is this?

7. A given mass storage device such as a hard disk can store 2 gigabytes of information. Assuming that each page of text has 25 rows and each row has 80 columns of ASCII characters (each character = 1 byte), approximately how many pages of information can this disk store?

8. Assume each memory location stores a byte. In a computer, memory locations 10000H to 9FFFFH are available for user. The first location is 10000H and the last location is 9FFFFH. Calculate the following:
   (a) The total number of bytes available (in decimal)
   (b) The total number of kilobytes (in decimal)

9. A given computer has a 32-bit data bus. What is the largest unsigned number that can be carried into the CPU at a time?

10. The data bus widths of several computers are listed below. For each computer, list the maximum unsigned value that can be brought into the CPU at a time (in both hex and decimal).

    (a) Apple 2 with an 8-bit data bus
    (b) IBM PC with a 16-bit data bus
    (c) IBM PC with a 32-bit data bus
    (d) Cray computer with a 64-bit data bus

11. Assuming that each memory location stores a byte, find the total amount of memory, in the units requested, for each of the following CPUs, given the size of the address buses.

    (a) 16-bit address bus (in K)
    (b) 24-bit address bus (in megabytes)
    (c) 32-bit address bus (in megabytes and gigabytes)
    (d) 48-bit address bus (in gigabytes, and terabytes)

12. Consider data bus and address bus, which is unidirectional and which is bidirectional?

13. Which register of the CPU holds the address of the instruction to be fetched?

14. Which section of the CPU is responsible for performing addition?

15. Is microprocessor or microcontroller more suitable to the von Neumann architecture? Why?

16. Is microprocessor or microcontroller more suitable to the Harvard architecture? Why?