Chapter-1: Introduction of Computer

1.1 Introduction:

We know information processing, plays very important role in taking decision every moment. In this context, computers play a significant role in bulk of information processing. Here, we study what is a computer and organization of a computer. The computer operates on a program or set of instructions. We discuss the important contribution made by the John Von Neumann. The objective is to understand the definition of computer, working concepts of the computer, stored program concept and Microprocessor.

Computer is defined as an electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program. In other words, Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of set of instruction. A personal computer, very commonly known as the PC or the home computer, refers to a microcomputer whose price, size and capabilities make it suitable for personal usage. They are normally single-microprocessors, single user system designed for general purpose applications. They have sufficiently large amount of internal memory to store programs and documents. A computer, indeed, is a machine that can perform a number of tasks for us. It can accept and store data, process it and produces the output. For performing these functions, computer systems consist of Input devices, a Central Processing Unit (CPU) and Output Devices.

1.2 Basic Functional Units of A Digital Computer:

A computer is an electronic device which accepts information and processes the information according to the program and produces the output. Computer programs may be written in High level languages like Pascal, Fortran, Cobol and so on. Some programmer also writes assembly language to carry out the desired task.

A computer system consists of hardware and software. Hardware refers to any physical, electrical, electromechanical components of the computer. For example keyboard, mouse,

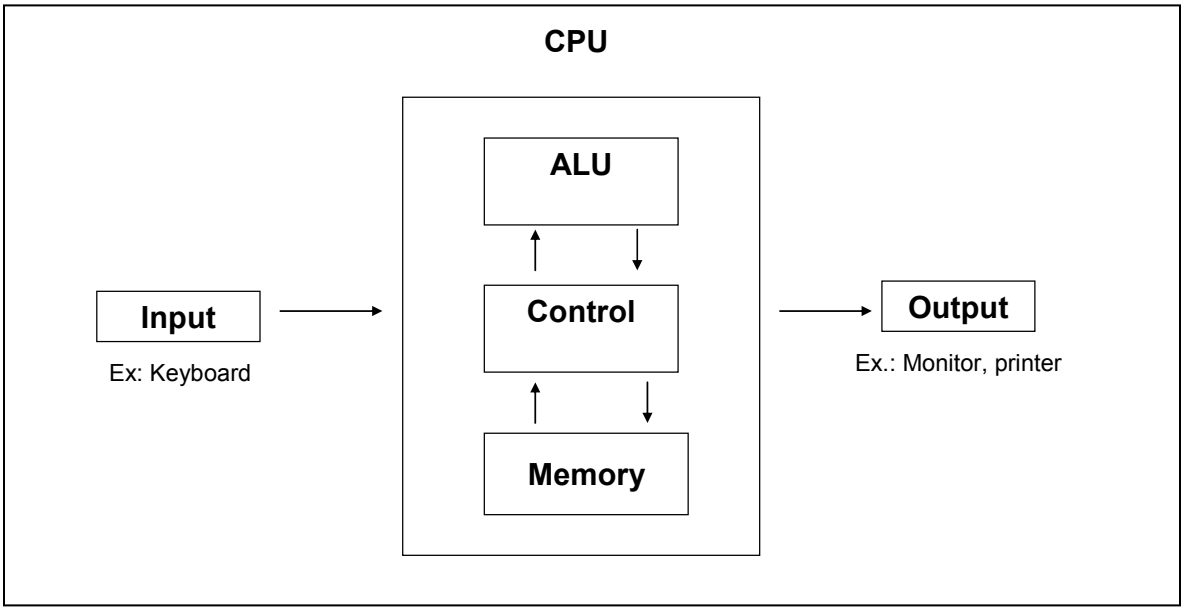
Dr. Uttam Sarkar, Asstt. Professor, Deptt. of Animal Genetics & Breeding, WBUAFS

cabinet of computer is considered as hardware. Software refers to a program or set of instructions that is written to achieve a specified task.

A computer system has five basic functional units which are listed below

a) Input Unit
b) Output Unit
c) Control Unit
d) Memory Unit
e) Arithmetic Logic Unit

Central Processing Unit



The figure 1.1 shows the computer organization depicting the basic units of a computer.

a) Input unit:

The input device is used to enter data and information into a computer. The devices like keyboard, mouse and scanner are commonly used as input devices. A keyboard is used to enter alphanumeric characters and symbols. The mouse is used to pick or select a command from the monitor screen. A scanner is used to scan an image or read a barcode and so on.

b) Central Processing Unit::

The processing unit comprises a processor which interprets the program instructions in memory, controls the flow of data and performs arithmetic and logical operations. The program instructions are processed

one at a time along with the necessary data. The results are sent to memory and the next instruction is processed. This method is repeated until the program is executed.

i) Arithmetic and Logic unit:

The arithmetic-logic unit (ALU) is the unit of the computer that performs arithmetic and logical operations on the data. This section of the machine can be relatively small consisting of circuits and registers which perform arithmetic (+, -, *, /) and logic (>,<,<=,>=,etc) operations. Arithmetic-logic units which can add and subtract and perform logical operations form the backbone for the arithmetic and control operations in computers. To perform scientific calculations the floating-point number system is used.

ii) Control unit:

The control unit controls the overall activities of the components of the computer. It is mainly used to coordinate the activities among other units. It will send commands signals and controls the sequence of instructions to be executed. The control unit may be defined as “the parts that effect the retrieval of instructions in proper sequence and application of the proper signals to the arithmetic unit and the other parts”.

The function of the control circuitry in a general purpose computer is to interpret the instruction words and then sequence the necessary signals to those sections of the computer that will cause it to perform the instructions.

iii) Memory Unit:

The memory unit is the unit where all the input data and results stored. The CPU memory is also called as memory register. The memory of a computer is also available in the form of Random Access Memory (RAM). RAM is a semiconductor chip. RAM is considered as a volatile memory, it means as long power is supporting information stored in it remain. Once the power is lost, the information stored in the RAM also get erased. Microcomputers contains read Only Memory (ROM). ROM contains instructions for the microcomputers. Microcomputers use ROM, programmable read only memory (PROM), and erasable programmable read-only memory (EPROM) to store selected application programs. The contents of ROM are determined when the chips are manufactured. The ROM memory is considered as non volatile, means the information is not get erased even when power is failed. The most important ROM chip(s) we should

know about is the Basic Input/output system or BIOS. The BIOS is a collection of small computer programs built into a ROM chip.

On personal computer there are three types of memory. They are

1) Conventional memory: The memory into which we load our software and work files. Conventional memory also known as base or low memory is any memory below 1M (1024) although only 640k of it is directly available for our work.

2) Extended memory (XMS): Memory above 1M. This type of memory is usually not directly available to our software.

3) Expanded memory (EMS): To expand the memory by reserving a special peephole of 64kb of memory to be used when the computer requests certain data not immediately available from RAM. Usually a software utility called an Expanded Memory Manager (EMM) manages this expanded memory.

c) Output Unit:

The output device is used to display or print result from a computer. Monitor, printer and plotter are commonly used output devices. A monitor is used to display the result in the form of text and graphics. The printer is used to print the result. A plotter is used to plot or print graphical result from a computer. Note that a result displayed in a monitor is temporary and it disappears when the next result is displayed, whereas the output printed using a printer or a plotter is permanent and these printouts can be used for any business correspondence or documentation. Normally soft copy is referred to information that is stored on the storage device. A hard copy refers to a print out showing the information.

1.3 Stored Program Concept:

Most computers use the stored-program concept designed by Hungarian mathematician John Von Neumann. In John Von Neumann architecture, a computing machine that uses a single storage structure to hold both the set of instructions on how to perform the computation and the data required or generated by the computation. Such machines are also known as stored program computer. The separation of

storage from the processing unit is implicit in this model. The storage of instructions in computer memory to enable it to perform a variety of tasks in sequence.

Stored program concept has the following features

a) Random access memory which stores information and is accessible independently of its content.

b) A central processing unit that accesses the RAM using a fetch-decode-execute cycle.

c) Input/output devices.

The time taken to access the memory is constant over all addresses; each address stores the same amount of information.

1.4 Points to Remember:

- A computer is an electronic device which takes information and process information according to the program and produces the output.
- A computer system has five basic functional units.
- The Central Processing Unit is the brain of the computer.
- The arithmetic-logic unit (ALU) is the unit of the computer that performs arithmetic and logical operations on the data.
- The control unit controls the overall activities of the components of the computer.
- The memory unit is the unit where all the input data and results stored.
- Stored program concept uses the memory unit to store both instruction or operation code and data or operands.