Lecture 2

Microcomputer Organization:

A microprocessor combined with memory and input/output

devices form a microcomputer. Therefore, the basic components of

a microcomputer are:

1) CPU

2) Program memory

3) Data memory

4) Output ports

5) Input ports

6) Clock generator.

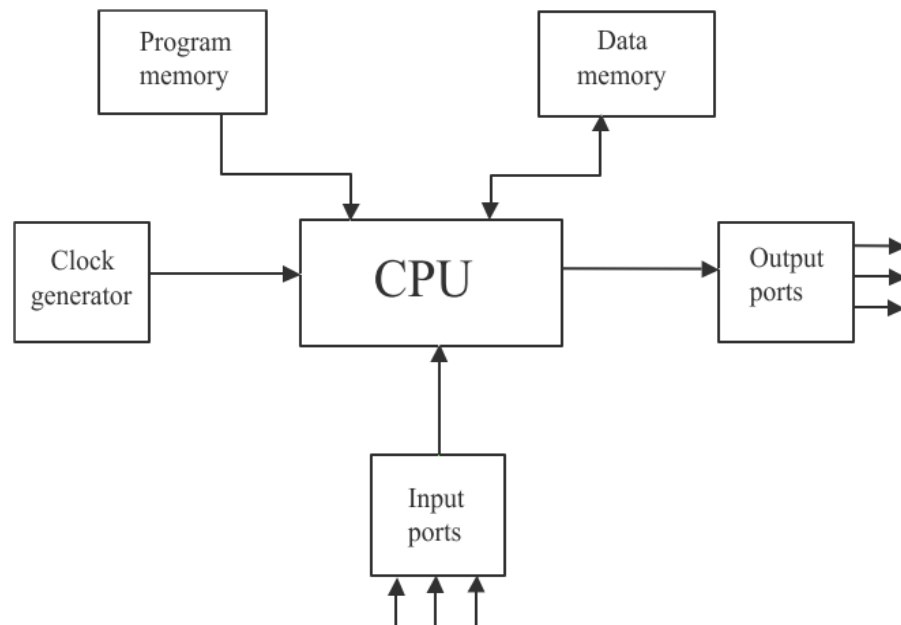These components are shown in fig.1 below:

Fig.1 Basic Components of Microcomputer

Central Processing Unit:

The CPU consists of ALU (Arithmetic and Logic Unit), register unit and control unit. The CPU fetches the stored instructions from the program memory, data word from data memory or from an input device and after processing the data stores the result in data memory or sends it to an output device.

a) ALU (Arithmetic and Logic Unit)

This unit performs computing functions these functions are arithmetic operations such as addition, subtraction and logical operation such as AND, OR, XOR, rotate, compare etc. Results are stored either in registers or in memory or sent to output devices.

b) Register Unit:

It contains various 8-bit or 16-bit registers. These registers are used primarily to store data temporarily during the execution of a program. Some of the registers are not accessible to user but they are used by the processor for the execution of an instruction. 8085A microprocessor contains 8-bit registers such as Accumulator (Reg. A), B, C, D, E, H, L etc. and16-bit registers such as Program Counter (PC), Stack Pointer (SP).

c) Control Unit:

It provides necessary timing & control signals required for the operation of microcomputer. It controls the flow of data between the microprocessor and peripherals (input, output & memory).

In all, the CPU has the following basic functions:

a. It fetches an instructions word stored in memory.

b. It decodes the instruction to determine what the instruction is telling it to do.

c. It executes the instruction. Executing the instruction may include same of the following major tasks:

1. Transfer of data from one register to another register in the CPU itself.

2. Transfer of data between a CPU register & specified memory location or input/output device.

3. Performing arithmetic and logical operations on data from aspecific memory location or a designated CPU register.

4. Directing the CPU to change the sequence of fetching

instructions, if processing the data created a specific condition.

5. Performing housekeeping function within the CPU itself in order to establish desired condition at certain registers.

d. It looks for control signal such as interrupts and provides appropriate responses.

e. It provides status, control, and timing signals that the memory and input/output section can use.

Memory:

It stores both the instructions to be executed (i.e. program) and the data involved. It usually contains ROM (Read Only Memory) and RWM (Read Write Memory). Both ROM & RWM are RAMs (Random Access Memory).

Both ROM & RWM are arranged into words, each of which has a unique address. The address of a word in memory is different than its contents. To refer the contents of a memory location, its address is placed in parentheses.

Therefore, Xis an address and (X) is the content of that address X.

Program Memory:

The basic task of a microcomputer system is to ensure that its CPU executes the desired instructions sequence. The instructions sequence is stored in the program memory.

Data Memory:

A microcomputer manipulates data according to the algorithm given by the instruction in the program in the program memory.

The control section transfers data to or from memory as

follows:

1. The control section reads an address to the memory.

2. The control section sends a read and write signal to the memory to indicate, the direction of the transform.

3. The control section waits until transfer has been completed. This delay precedes the actual data's transfer in the input case and follows it in the output case.

Input/Output Ports:

The input & output ports provide the microcomputer the capability to communicate with the outside world.

Clock Generator:

The clock generator generates the appropriate clock periods during which instructionexecutions are carried out by the microprocessor.