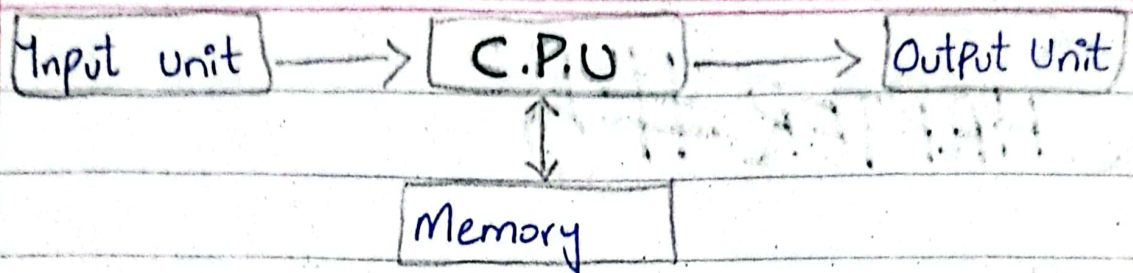# CHAPTER #5

COMPUTER ARCHITECTURE

Q. Define Computer Architecture.

Computer Architecture: Computer Architecture is concerned with the structure and behaviour of computer. It includes information formates, the instruction set & techniques for Addressing memory.

Q₂ List main Units of Computer. Describe the function of each units.

Ans Digital Computers are classified as a collection of few basic# units.

1) Input Unit
2) Output Unit
3) Central processing unit
4) Memory

```
┌───────────┐      ┌─────────┐      ┌─────────────┐
│ Input unit│─────>│  C.P.U  │─────>│ Output Unit │
└───────────┘      └─────────┘      └─────────────┘
                        ↕
                   ┌─────────┐
                   │ Memory  │
                   └─────────┘
```

Basic unit of digital Computer.

1) Input Unit :

The input provides an interface between user & machine for inputting data and instruction etc. Data can be input in many forms; audio, Visual, graphical, etc.

2) Output Unit :

The Output unit provides an interface b/w user & machine. it receives data from C.P.U in the form of binary bits.

3) Central Processing Unit:

The CP.U is the brain of computer System. It contains Arthmetic logic units, control unit, register & buses

4) Memory Unit:

It is also known as main memory that is used to hold data and information

Q3 Define register, what is the function of register? Name some important Registers of C.P.U.

Register:-

A register is a temporary storage device which holds data or instruction as long as it is being manipulated.

1. GENERAL PURPOSE REGISTER:

They may be used for temporary storing. They are also known as programmable register. As they are programmed by user with the help of instruction

a) ACCUMULATOR (AC):-

It is used to store data for arthmetic and logic opperation.

b) STATUS REGISTER:-

It is also called flag register as it holds one bit flag to indicate certain

conditions that arise during arithmetic and logic operations.

2. SPECIAL PURPOSE REGISTER:

They are designed for specific function within the C.P.U.

a) MEMORY BUFFER REGISTER (MBR):

It is also known as memory data register. It is used to hold a word that is being stored in the memory location.

b) MEMORY ADDRESS REGISTER (MAR):

It holds the address of memory location

c) INSTRUCTION REGISTER (IR):

It holds the actual instructions being executed currently by the computer.

d) PROGRAM COUNTER (PL):

It deals with the order of execution of instruction. It acts as a pointer which indicates the subsequent memory location when instruction is stopped.

e) STACK POINTER (SP):

Stack is defined as a set of memory location, and **stack** pointer is defined as indicator to these memory location.

Qu Define Buses and its types

Buses:- In a micro computer, the input/output devices and memories are connected to microprocessor by means of wire called Buses. There are 3 types of Buses:
i) Address Bus
ii) Data Bus
iii) Control Bus

a) ADDRESS BUS:

The address bus is used by microprocessor to transmit the address of the memory
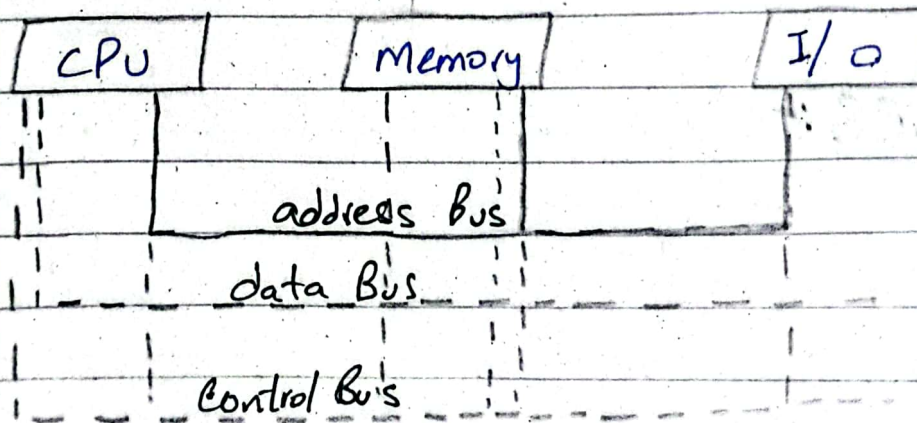
location which it wants to access for reading or writing purposes.

b) DATA BUS:

The data bus is used to transmit data from the memory to microprocessor and vice versa.

c) CONTROL BUS:

Control bus supervises the reading or writing of data. It transmit signals to all the devices at proper time.


```
 ┌──────┐        ┌──────────┐        ┌──────┐
 │ CPU  │        │ Memory   │        │ I/O  │
 └──────┘        └──────────┘        └──────┘
      │                │                 │
      └──── address Bus ─────┘           │
      └──── data Bus ────────────────────┘
      └──── Control Bus ──────────────────
```

Qs Describe instruction format & its types.

Instruction Format

- Three Address Instruction
- Two Address Instruction
- One Address Instruction
- Zero Address Instruction

=> **Instruction Format:** An instruction format defines Layout of bits of an instruction in terms of its constituent parts

1) THREE ADDRESS INSTRUCTION:

It contains operation code, address of two operands and destination address.

OP code	Address 1	Address 2	Address of destination

Example:-

ADD A,B,C

C = A+B

2) TWO ADDRESS INSTRUCTION:

It contains operation code, address of one operand and address of storage location.

OP code	Address 1	Address 2

Example:

Move A,B

3) ONE ADDRESS INSTRUCTION:

It contain operation code & address

OP code	Address 1

Example:

CLOSE 'x'

4) ZERO ADDRESS INSTRUCTION:

They are called stack instruction & consists of operation code only

OP code

Example: CLR

Q What is stack ?

STACK:- A stack is a storage method in which items are stored in consecutive memory location.

Q How push & Pop functions are performed in stack?

1. "Push" is the term used for inserting an element into a stack.
2. "Pop" is the term used for removing an element from a stack.

<u>PREFIX NOTATION</u>:- //(FORWARD POLISH)

eg:-

$$A + B = +AB$$
$$C/D = /CD$$
$$x * y = * xy$$

<u>POST FIX NOTATION</u>:- //(REVERSE POLISH)

eg:-

$$A + B = AB+$$
$$C/D = CD/$$
$$x * y = xy *$$

Q Convert the following expressions into reverse polish notation.

1) $A*B + C*D + E*F$
$AB*CD*EF*++$

2) $A*B + A*(B*D + C*E)$
$BD*CE*+A*AB*+$

Q Describe instruction cycle with its steps in detail

ANS **INSTRUCTION CYCLE :-** The processing required for a single instruction is called a instruction cycle. There are 3 steps involved in it.

- Fetch
- Decode
- Execute

1. **FETCH:** The fetch cycle is the duration of time in which an instruction stored in the memory is brought to an appropriate register.

2. **DECODE:-** The C.P.U decodes the fetched instructi to determine what operation needs to be performe

3. **EXECUTE:** The process of execution of an instruction by the C.P.U in a specified interval of time is called execute cycle.