

# **Introduction to Computer** **Organization**

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# What is Computing?

- The process of utilizing computer technology to complete a task. Computing may involve computer hardware and/or software, but must involve some form of a **computer system**.
- Processing, structuring, and managing various kinds of information.

# What is Computer?

- A computer can be defined as a fast electronic calculating machine that accepts the (data) digitized input information, process it as per the list of internally stored instructions and produces the resulting information.
- The basic operations are :  
Inputting, Storing, Processing, Outputting and Controlling.

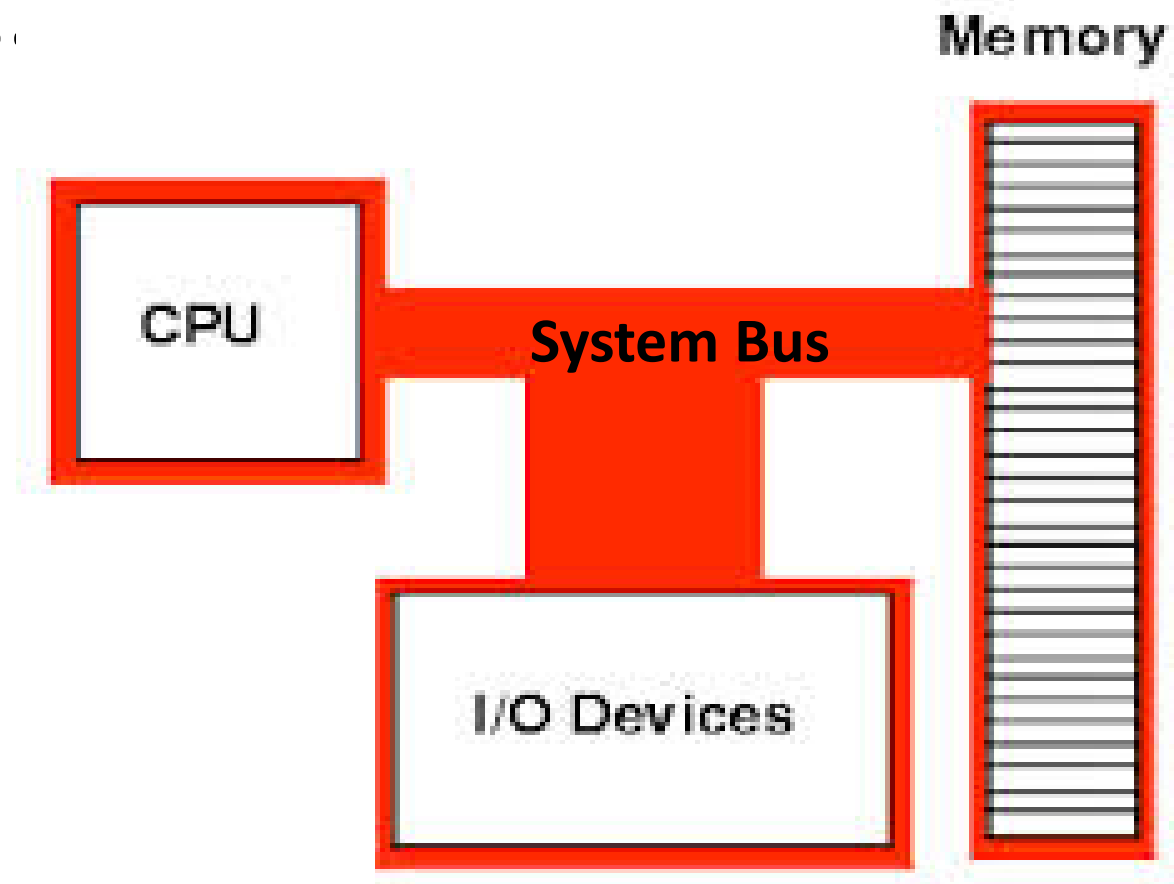
# Computer Architecture Vs Computer Organization

1. Architecture: Functional behavior of a computer system as viewed by a programmer.  
e.g. size of a data type -32 bits for *int*
2. Organization: Structural behavior that is not visible to the programmer.  
e.g. clock frequency

# Von-Neumann Architecture

- The first written description of how an electronic computer should store and processes information; **Von Neumann architecture** was originally published in John Von Neumann's report of the EDVAC on June 30, 1945.
- It is also called stored program architecture.
- It generally includes 3 blocks :
  - CPU - combination of CU & ALU
  - Memory - to store data as well as instruction
  - Peripherals – I/O devices

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# Von Neumann Bottleneck

- In the von Neumann architecture, programs and data are held in memory; the processor and memory are separate and data moves between the two. In that configuration, *latency* is unavoidable.

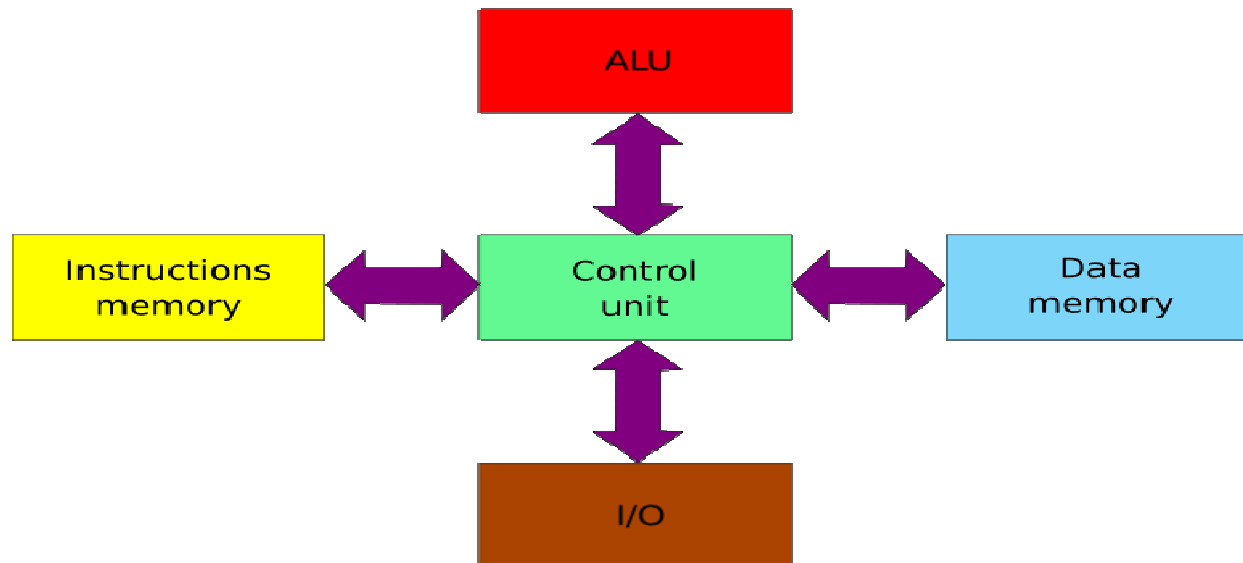
Possible solution - *Caching*

- Instruction fetch and a data operation cannot occur at the same time because they share a common bus.

Possible solution - *Harvard Architecture*

# Harvard Architecture

- It is also a stored-program system but has one dedicated set of address and data buses for reading data from and writing data to memory, and another set of address and data buses for fetching instructions.



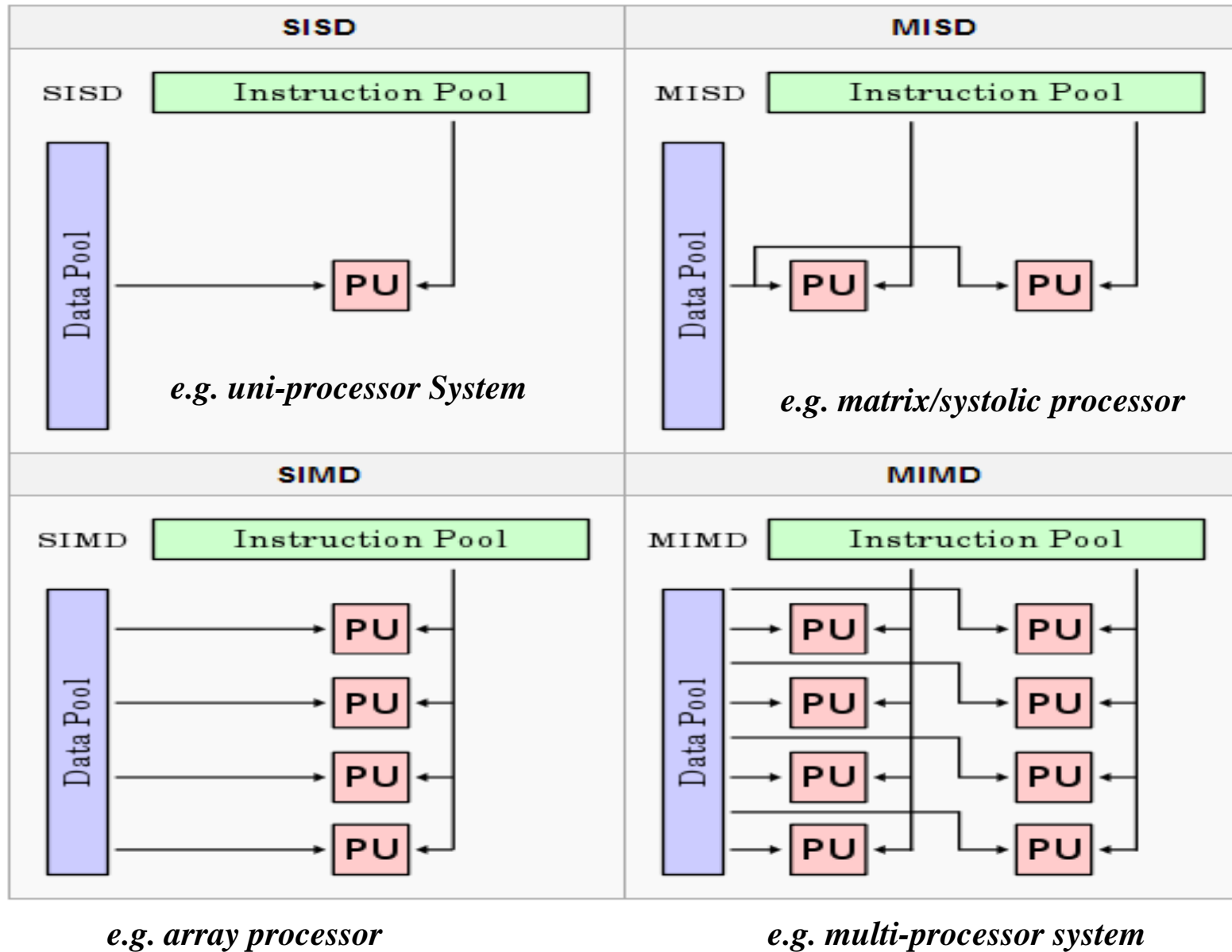


# Flynn's Classification

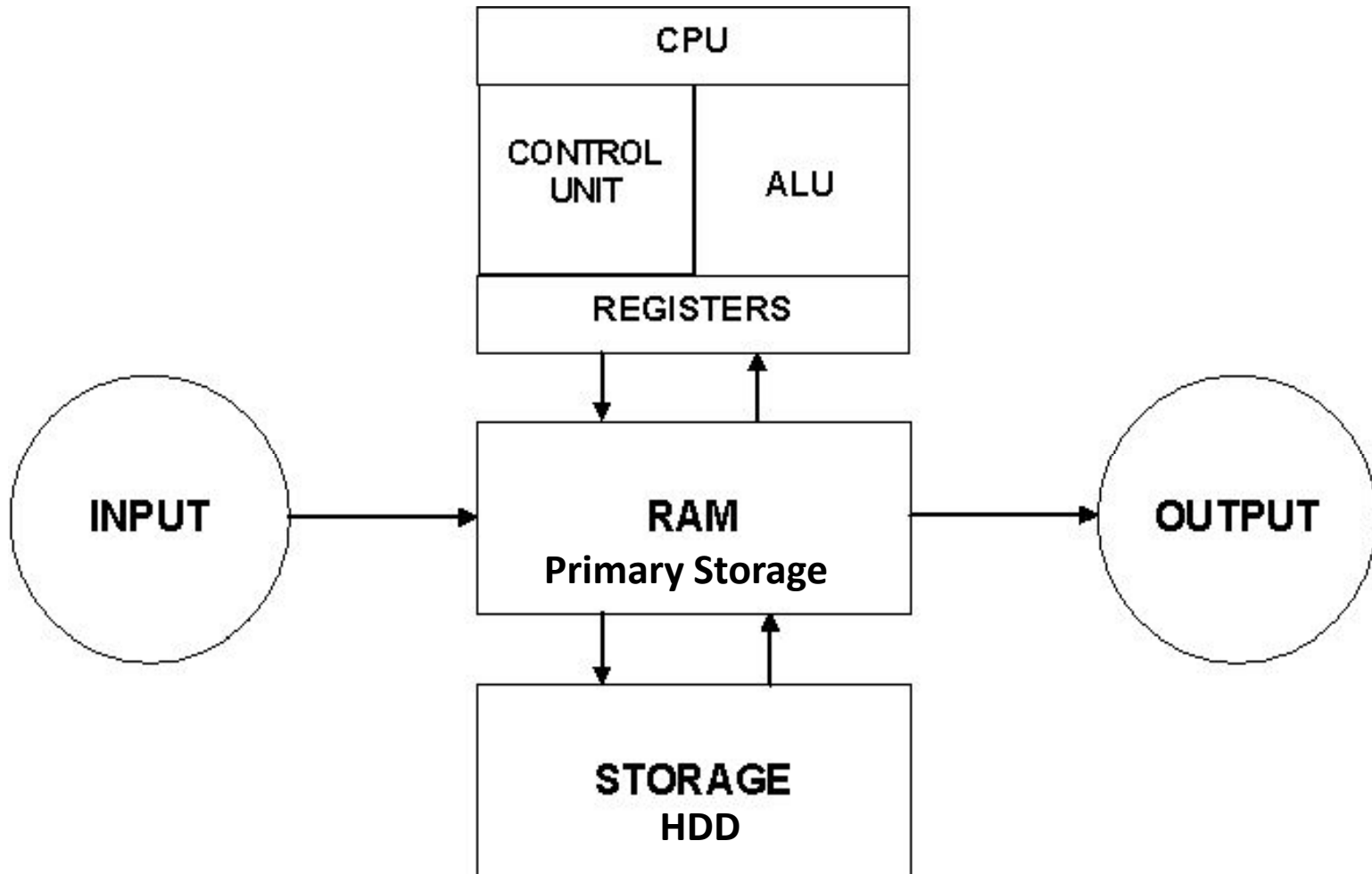
- *Flynn's taxonomy* is a classification of computer architecture on the basis of *multiplicity of instruction & data streams*.
- *Instruction Stream* - sequence of instructions read from the memory.
- *Data Stream* - operation performed on sequence of data in the processor.

	Single instruction	Multiple instruction
Single data	SISD	MISD
Multiple data	SIMD	MIMD

# Cntd...



# Basic Computer System



# H/W vs S/W

**1. Computer hardware** is the collection of physical elements that constitutes a computer system.

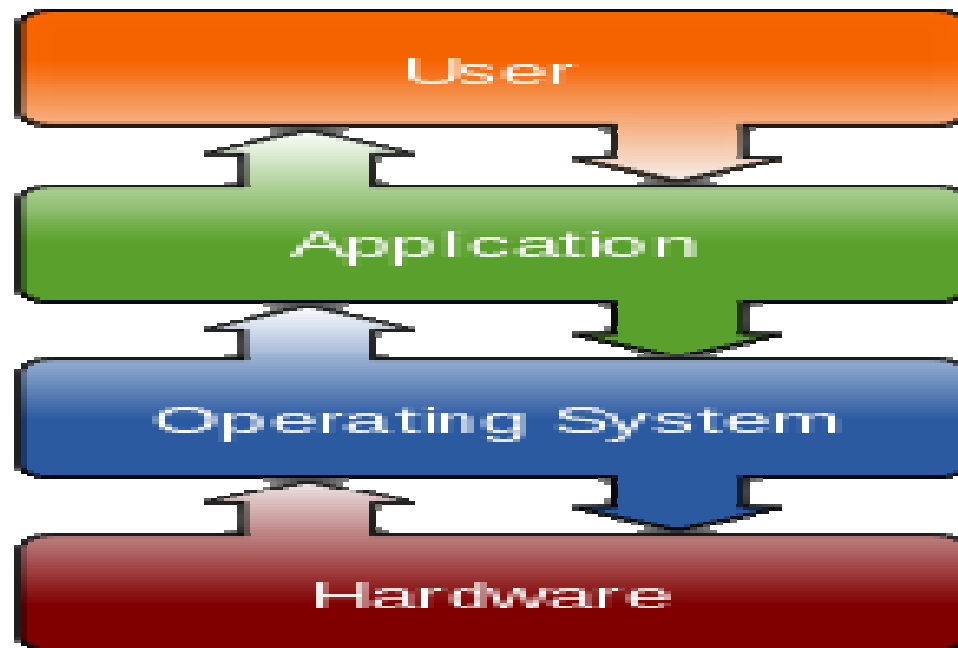
e.g. RAM, HDD, Keyboard, Monitor, etc.

**2. Software** is any set of machine-readable instructions that directs a computer's processor to perform specific operations.

A combination of hardware and software forms a usable computing system.

# Operating System

- An **operating system (OS)** is a collection of softwares that manages computer hardware resources and provides common services for computer programs. The operating system is a vital component of the system software in a computer system.



# How to Communicate?

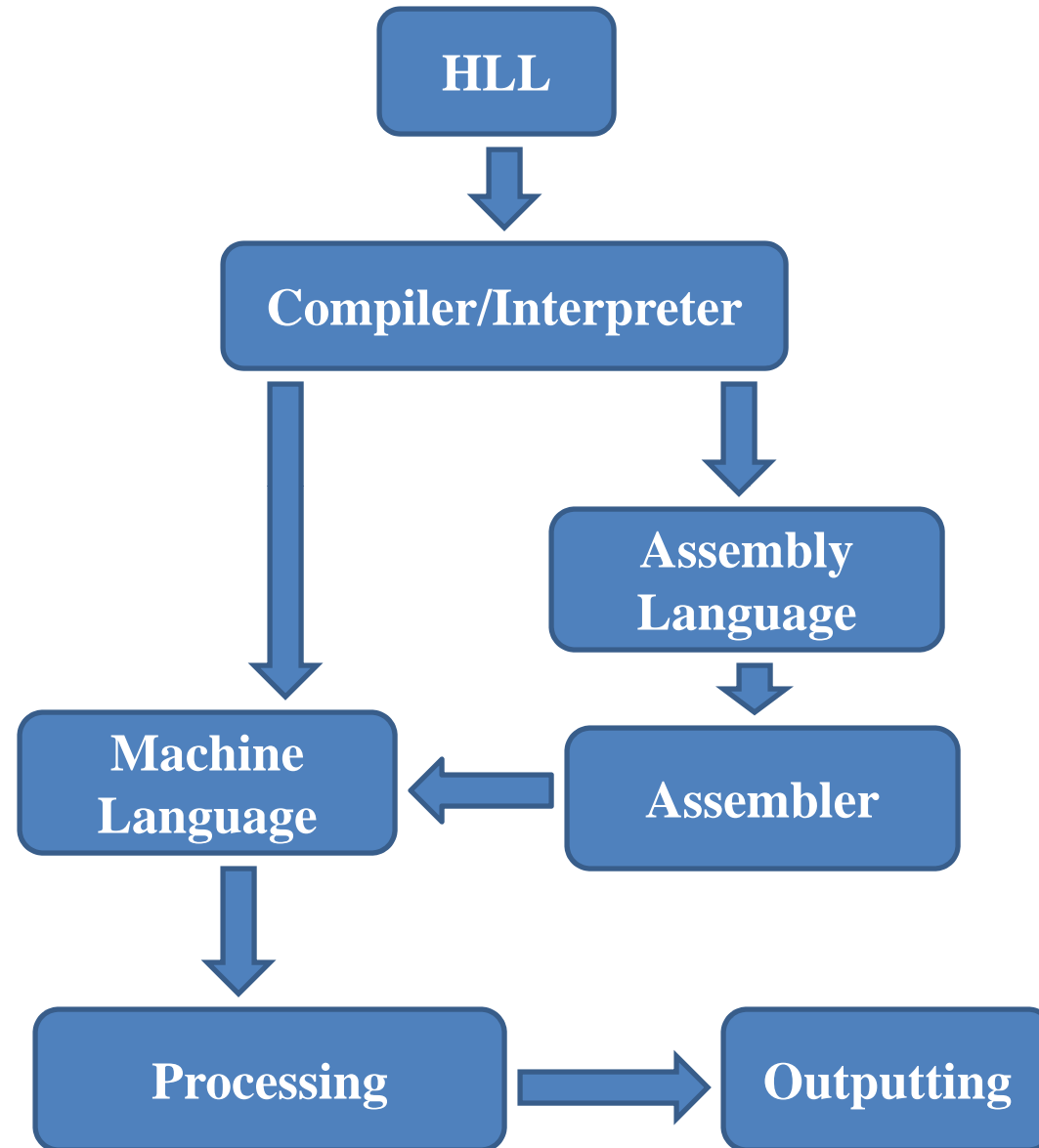
- **Man-to-Man** : language - English, Bengali, Hindi, etc.
- **Man-to-Machine** : language especially High –level-language – BASIC, COBOL, FORTRAN, etc.

But computers can only understand Low-level-language (bit patterns)

Low-level-Languages further classified into 2 types –  
Machine language & Assembly language.

So, we must need some translator to convert HLL into its equivalent LLL – compiler, interpreter, assembler

Cntd...







1. A source program is usually in \_\_\_\_\_.
  - a) Assembly language
  - b) Machine level language
  - c) High-level language
  - d) Natural language
  
2. The registers, ALU and the interconnection between them are collectively called as \_\_\_\_\_.
  - a) Process route
  - b) Information trail
  - c) information path
  - d) data path
  
3. The information in a digital computer is represented in the form of \_\_\_\_\_.
  - a) Bits
  - b) Bytes
  - c) Kilobytes
  - d) Megabytes

4. The flow of information among various units is controlled by

a) Control Unit

b) ALU

c) Memory unit

d) Peripherals

5. The basic principle of Von Neumann computer is

a) program & data in separate memory

b) program & data in same memory

c) large no. of registers

d) large amount of memory

6. Harvard architecture uses separate memories to store data & instruction

a) True

b) False

7. Assembly language & machine language both are same

a) True

b) False

8. The only difference between Von Neumann & Harvard architecture is

a) Both uses separate bus for instruction & data

b) Both uses same bus for instruction & data

c) Only Von Neumann uses separate bus for instruction & data

d) Only Harvard uses separate bus for instruction & data

9. Assembler converts HLL into LLL

a) True

b) False

10. Compiler converts HLL into LLL

a) True

b) False

# References

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3. Computer Architecture & Organization – John P. Hayes
4. Xpress Learning - Computer Organization & Architecture
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6. Computer Organization & Architecture – T. K. Ghosh

*Thank You*