C01

UNIT -1

COMPUTER ORGANIZATION

- Types of computer
- Operation of computer
- Operation of CPU
- SPEC rating
- Historical perspective of computers.

Explain The different Types of Computers

A computer is an electronic device that is used to perform complex computation quickly & accurately.

It executes set of instructions [program] & produces the result.

The program that the computer executes will be in main memory.

There are many types of computers that exists. The type of computer varies in size, cost, computational power & the use.

The most commonly used computer is Personal computers or desktop computers.

These computers are used at homes, schools, colleges & offices.

The smaller version of desktop computers is laptops & Note books.

The next type of computer is workstations.

These computers will have high capacity input/output. It will also have more computational power than personal computers.

The Third Type of computers are

1. Enterprise System
2. Severs
3. Supercomputers

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Enterprise system is also called as Mainframes.

These computers are used for business data processing.
They have large storage capacity & more computational power than workstations.

Severs are low end versions of supercomputers.
These computers are special type of systems that have large database storage units & can also execute requests from other computers.
These are used at educational Institutions & offices

Supercomputers are used for very complex numerical calculations.
They are used in weather forecasting & aircraft design.

Explain the operation of computer

The computer accepts the information in the form of program & data through an input device.
The entered program & data is stored in memory.
The stored information is fetched into CPU & executed by ALU.
Once the information or instruction is executed, the result is displayed at output unit.
All the activities of the computers are controlled by control unit

Explain The operation of CPU

The CPU consists of 2 units

① ALU - Arithmetic & logic unit.

② CU - control unit

ALU is used for Arithmetic & logical operations.
The CU is used for controlling the activities of the system.

Apart from these 2 units, it also consists of registers.
Registers are storage unit of CPU.
There are 2 types of registers.

① General purpose register

② Special purpose register

The following are the steps that takes place to execute an instruction.

The address of first instruction to be executed gets loaded into program counter [PC].

The same address is copied to Memory Address register [MAR].

The CPU will go to that address & will fetch the instruction.

The instruction is a combination of opcode & operand. CO1

once the instruction is fetched, it will be stored in Instruction register [IR].

Now the data is fetched one after the another & copied on to Memory Data Register [MDR].

From MDR, data is copied on to general purpose registers [R0 - Rn-1].

once the opcode & operand is available in CPU, the instruction is executed with the help of ALU.

The result before getting stored on to memory will be copied to MDR

PERFORMANCE OF COMPUTER

Refer class Notes.

Explain SPEC rating.

SPEC stands for system Performance Evaluation corporation. This is a non profit organization that is used to determine system Performance

The performance is measured as follows

A set of programs known as BENCH PROGRAM or STANDARDIZED PROGRAMS are used.

The computers are made to execute these program & performance is determined using an equation known as SPEC RATING.

The equation is given by the formula

$$\text{SPEC rating} = \frac{\text{Running Time on Reference computer}}{\text{Running Time on computer under Test}}$$

Different types of programs like compiler, games, database application, astrophysics & quantum chemistry programs are executed on reference computer & computer under Test.

The SPEC rating of 50 means, computer under Test is 50 Times faster than reference computer

The Test is repeated & geometric mean is computed. overall SPEC rating is given by.

$$\text{SPEC rating} = \left(\prod_{i=1}^{n} \text{SPEC}_i\right)^{1/n}$$

$n \Rightarrow$ no of Programs.

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write a note on historical Perspective of computers

First generation computer

These were the first computers which were invented. The concept known as stored program concepts were introduced by John Von Neumann.

Program & their data were stored in some memory.

Assembly language were used for programing.

Assembly level programs were converted to machine level program by software known as assemblers.

The converted binary program were executed.

The arithmetic operations were executed within a few milliseconds.

The logic functions were implemented using Vaccum Tubes.

Mercury delay line memory were used.

Input output functions were performed by devices similar to Typewriters.

Magnetic memories & Magnetic Tape storage devices were developed.

Second generation computer

Transistor were introduced & vaccum tubes were replaced.

Memories were Magnetic core memories & magnetic storage drums.

High level languages like FORTRAN were used for writing softwares.

Compilers were introduced to convert programs to binary.

Separate I/o processors were introduced.

The performance & computation was better than first generation computers.

Third generation computers.

The integrated circuit technology was introduced. This enabled many transistors were fabricated on a single chip.

The processors were more faster & cost also was reduced.

Integrated circuit Memory was introduced instead of Mognetic Memory.

Microprograming, Paralellism & pipelining were introduced.

cache & virtual memories were introduced.

Fourth generation computers

Integrated circuit Technology allowed large portion of main memory to be embedded on single chip.

very large scale Integration was introduced. This allowed Thousands of transistors to be placed on single chip.

Concepts like concurrency, pipelining, cache were introduced.

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Explain functional units of a computer

Any computer would consists of 5 functional units.

1. Input unit
2. output unit
3. Memory unit
4. Arithmetic & logic unit
5. Control unit

Diagram - Refer class Notes.

Input unit are used for giving inputs to computer. one of the well known input device is keyboard. Whenever a key is pressed on keyboard, the corresponding binary value is given to computer.

Memory unit is used for storing program & data.

There are 2 Types of memory

1. Primary
2. secondary.

Primary memory is a fast memory operating at high electronic speeds. The programs gets executed only if it is present on primary memory.
The memory consists of numerous location & each location is identified using address.

Each location consists of numerous bits. The bits are grouped to form a byte. Bytes are grouped to form word. In a word instruction is stored.

Ex: RAM, ROM etc

The secondary storage is permanent storage Magnetic tape device. Using secondary storage, large amount of data can be stored. However secondary storage devices are slow when compared to primary storage devices.

Ex: Hard disk.

Arithmetic & logic unit [ALU] is used for executing programs. ALU is present inside the computer's central processing unit.

Output unit is used for displaying the result of computation. The well known output devices are printer & Monitor. The output units are very slow compared to processor.

Control unit is used for coordinating the operation of remaining units. It is used for generating control & Timing signals. Data Transfer b/w Memory & I/O or Processor & I/O is controlled using control unit.

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Explain how to improve performance of a computer.

Refer class NOTES.

Write a note on stored program

To instruct the computer, a computer has to be programed. A program consists of numerous instructions. Instructions are command that

- Specify arithmetic & logic operations to be performed.
- It also governs transfer of data b/w computer & I/o devices.

The program, if it has to get executed, it should be stored in memory. The processor then fetches one instruction after other & performs desired operation. This is known as stored program.

Explain Bus structure

All the functional units present in the computer system must be interconnected to work properly.

All the functional units are connected using a single Bus.

Diagram: Refer class Notes.

The Bus can be used for only one transfer at a time, as a result only 2 units can use the Bus at any given time. The main advantage of single Bus is less expensive.

The device connected to the Bus vary in the operational speed. In other words, fast devices like processor & slow devices like printers are connected to same Bus. As a result, an efficient data transfer mechanism must be deviced.

one of the mechanism is to use buffers registers. For example if the processor has to send the data to printer, it would send it to printer buffer. Once the buffer is loaded, the printer begins to print. This ensures that processor is not wasting its time for a slow device like printer.

What are the factors which are used to judge the performance of a computer? Explain any three of them.

The factors which affect performance of computer are

(1) Processor clock

(2) Basic performance equation

(3) clock rate

(4) Pipelining

(5) Instruction set

(6) cache Memory

[Explain processor clock, Basic performance equation & cache from Notes.