CHAPTER - 7

GENERATIONS OF COMPUTER

OBJECTIVES OF THIS CHAPTER

7.1 INTRODUCTION

In computer terminology, Generation is a change in technology of computer. Earlier, the generation term was used to distinguish between varying hardware technologies. But now-a-days, generation includes both hardware and software, which together make up an entire computer system. There are totally five computer generations known till date. These are explained as follows:

7.2 FIRST GENERATION COMPUTERS (1942-1955)

The time period of first generation was 1942-1955. The first generation computers used vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit). These tubes were like electric bulbs which produced a lot of heat and were prone to frequent fusing. They were very expensive and could be afforded only by very large organizations.

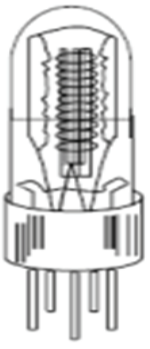

Figure 7.1 Vacuum Tube

In this generation, mainly Batch Processing Operating Systems were used. Punched cards, Paper tape and Magnetic tapes were used as Input & Output devices. Machine codes and electric wired board languages used to operate the machines.

Main features and characteristics of First Generation:

- **Vacuum Tubes** as basic processing component, **Electromagnetic Relay** as main memory; **Punched Cards** as secondary storage were used.

- Machine and Assembly languages and stored program concept for operating the machines were used.
- They were very much bulky in size and produce a lot of heat.
- They were not much reliable systems.
- They could not be commercially used.
- They were costly and difficult to use.

Examples of First Generation Computer Systems:

- ENIAC (Electronic Numerical Integrator and Computer)
- EDVAC (Electronic Discrete Variable Automatic Computer)
- EDSAC (Electronic Delay Storage Automatic Calculator)
- UNIVAC I (Universal Automatic Computer I)
- IBM 701 (International Business Machines 701)

7.3 SECOND GENERATION COMPUTERS (1955-1964):

The time period of second generation was 1955-1964. This generation used the transistor as their basic processing component. They were cheaper, consumed less power, more compact in size, more reliable and faster than the first generation machines. In this generation, magnetic cores were used as primary memory, and magnetic tape and magnetic disks as secondary storage devices.

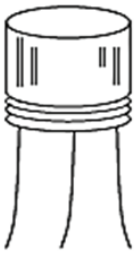

Figure 7.2 Transistor

In this generation, Assembly Language and High-Level Programming languages like FORTRAN and COBOL were used. Batch processing and Multiprogramming Operating systems were also used.

Main features and characteristics of Second Generation:

- **Transistors** as the basic processing components, magnetic cores as main memory, **Magnetic Tapes** and **Disks** as secondary storage were used.
- Batch Operating System and High-Level Programming Languages were used.
- They were faster, smaller in size, more reliable and easier to program than first generation systems and were used for scientific and commercial applications.
- Commercial production of second generation computers was still difficult.
- They were costly.

- They generated less heat as compared to first generation computers.
- They consumed less electricity as compared to first generation computers.

Examples of Second-GenerationComputer Systems:

- IBM 7030
- UNIVAC LARC (Livermore Advanced Research Computer).

7.4 THIRD GENERATION COMPUTERS (1964-1975)

The time period of third generation was 1964-1975. The third generation of computer used Integrated Circuits (IC's) in place of transistors. A single IC has many transistors, resistors and capacitors along with the associated circuitry. The IC was invented by Jack Kilby. This development made computers smaller in size, reliable and efficient.

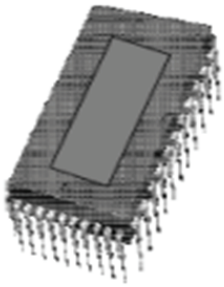

Figure: 7.3 IC (Integrated Circuit)

In this generation, Remote processing, Time-sharing, Real-time, Multi-programming Operating Systems were used. High-level languages such as FORTRAN-II TO IV, COBOL, PASCAL PL/1, BASIC, ALGOL-68, etc. were used during this generation.

Main features and characteristics of Third Generation:

- ICs with SSI and MSI technologies were used as basic processing components
- Larger magnetic cores main memory, larger capacity disks and magnetic tapes as secondary storage were used.
- They used Time sharing operating system and multi-programming operating systems.
- They were commercially easier to use and easier to upgrade.
- They were used for Scientific, commercial and interactive online applications.

Examples of Third Generation Computer Systems:

- IBM 360/370-(International Business Machines 360/370)
- PDP-8-(Personal Data Processor-8)
- PDP-11-(Personal Data Processor-11)
- CDC 6600-(Control Data Corporation 6600)

7.5 FOURTH GENERATION COMPUTERS (1975-1989)

The period of Fourth Generation was 1975-1989. The fourth generation of computers used Very Large Scale Integrated (VLSI) circuits. VLSI circuits having about 5000 transistors, other circuit elements and their associated circuits, all on a single chip made it possible to have microcomputers of fourth generation. Fourth Generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to personal computer (PC) revolution.

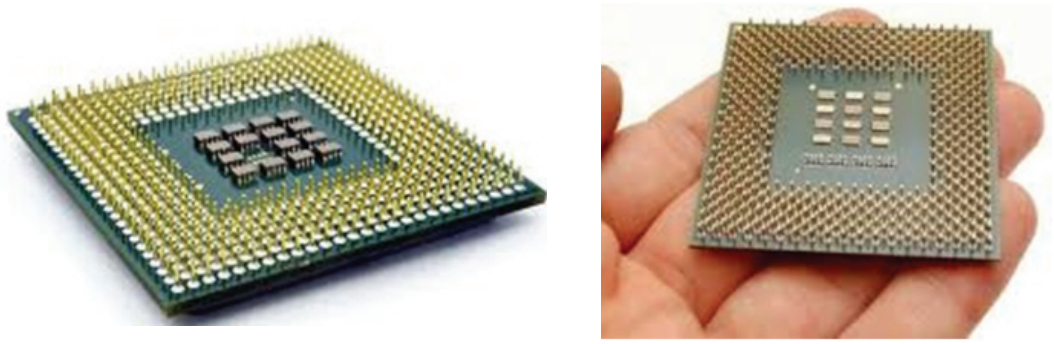

Figure: 7.4 Microprocessors

In this generation, Time sharing, Real time, Network, Distributed Operating Systems were used. All the higher level languages like C and C++, DBASE, etc., were used in this generation.

Main features and characteristics of Fourth Generation:

- ICs with VLSI Technology and microprocessors as processing components were used in the computers of this generation.
- Semiconductor main memories and larger capacity hard disks as secondary storage were used in these computers.
- Magnetic tapes and floppy disks were used as portable storage media.
- Operating systems for PCs with GUI and multiple windows on a single terminal screen were used in these computers.
- Multi-Processing OS, UNIX Operating System, C Programming language, Object-Oriented Programming were used in these computers.
- PC, Network-based and supercomputing applications were used in these computers.
- These computers were small, affordable, reliable, and easy to use.
- They were totally general purpose machines, easier to produce commercially and easier to upgrade.

Examples of Fourth Generation Computer Systems:

- IBM PC and its clones
- Apple II
- CRAY-1
- CRAY-2
- CRAY-X/MP

7.6 FIFTH GENERATION COMPUTERS (1989-onwards):

The period of Fifth Generation is 1989-till date. In the fifth generation, the VLSI technology became ULSI (Ultra Large Scale Integration) technology. The ULSI microprocessor chips have ten million electronic components in them.

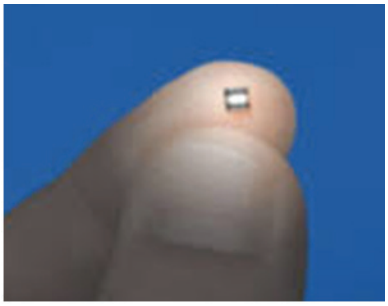

Figure:7.5 ULSI chip

This generation is based on Parallel Processing Hardware and AI (Artificial Intelligence) software. AI is an upcoming branch in computer science which interprets means and methods of making computers think like human beings.

AI includes the following areas:

- Robotics
- Game Playing
- Development of Expert Systems to make decisions in real life situations
- Natural language understanding and speaking

All the higher level languages like C, C++, Java, .Net, etc., are used in this generation.

Fig 7.6 Robotics using AI (Artificial Intelligence)

Main features and characteristics of Fifth Generation:

- ICs with ULSI technology, larger capacity main memory, hard disks with RAID support are used.
- Optical disks as portable read-only storage media are used.

- Notebooks, powerful desktop PCs and workstations, powerful servers and supercomputers are used in this generation.
- Internet and Cluster computing is used.
- Multithreading, Distributed OS, Parallel Programming,JAVA, World Wide Web, Multimedia, Internet based applications are used.
- These are portable computers, and are more powerful, cheaper, reliable, and easier to use.
- These computers have high uptime due to hot-pluggable components and they are totally general purpose machines.
- These computers are easier to produce commercially.
- Rapid software development is possible

Examples of Fifth Generation Computer Systems:

- IBM notebooks
- Pentium PCs
- SUN Workstations
- IBM SP/2
- PARAM 10000

Points To Remember

1. In computer terminology, Generation is a change in hardware as well as software technology of computer.
2. The first generation computers used Vacuum Tubes as the basic components for memory and circuitry for CPU
3. Second generation used the Transistor as their basic component.
4. The third generation of computer used Integrated Circuits (IC's) in place of transistors.
5. A single IC has many transistors, resistors and capacitors along with the associated circuitry.
6. The fourth generation of computers used Very Large Scale Integrated (VLSI) circuits.
7. Fourth Generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to personal computer (PC) revolution.
8. In the fifth generation, the VLSI technology became ULSI (Ultra Large Scale Integration) technology.
9. AI is an upcoming branch in computer science which interprets means and methods of making computers think like human beings.

1. Multiple Choice Questions:

I. Second generation of computers used the _____ as their basic component.

a) Vacuum Tubes b) VLSI

c) ULSI d) Transistor

II. The _____ generation of computers used VLSI circuits.

a) First b) Second

c) Third d) Fourth

III. The third generation of computers used _____ in place of transistors.

a) Integrated Circuits b) Vacuum Tubes

c) ULSI d) VLSI

IV. _____ is an upcoming branch in computer science which interprets means and methods of making computers think like human beings.

a) Robotics c) ULSI

c) Artificial Intelligence d) Integrated Circuits

V. ULSI technology is used in _____ generation of computers.

a) Second b) Third

c) Fourth d) Fifth

2. Write the Full forms:

I. ENIAC II. IBM

III. IC IV. VLSI

V. ULSI VI. OI

3. Very Short Answer Type Questions

I. Write the main features of First Generation computers.

II. Which technology was used for Second Generation of Computers?

III. What is IC?

IV. Write about Fourth Generation of computers.

V. What is AI? Write the areas which are included in AI.

VI. Write the examples of First Generation of Computers.

4. Long Answer Type Questions

I. What do you mean by Generation of Computers? How are they classified?

II. Explain Fifth Generation of Computers.