Chapter 2.

History Of Computers

Everyone says that computers are the latest buzzword that is happening in every walk of life. It is only the modern a*vatara* of Computer; otherwise the history of computers goes back to the Vedic, Harappan, Greek, Egyptian and Japanese civilizations.
If we go by the simplest definition of computer then it is the instrument, which helps in computing. The idea of computing arisen due to the concept of counting. In the initial years of the development of human civilizations probably the fingers of our hands were the most common instrument to count the things, like one finger for one & two fingers for two & so on. Then many other things like sticks, small stones & other objects available naturally in abundant numbers were used to help counting.
Different civilizations grew & chosen their own methods of counting. As the trading started for various items & people came into contact with other civilizations, the need for counting & calculations grew many folds. Different civilizations invented different numerals to be used for counting. The invention of zero by India is very significant in this context. Different numerals used for counting have been shown in figure. With coming of numerals the system of writing them came into being. The decimal number system is now most prevalent universally. Slowly & slowly various civilizations contributed to the different aspects of mathematics. So, What we are doing today with the help of mathematics is the outcome of thousands of years of sustained research & growth.

The computers of today are also the outcome of thousands of years of brainstorming & application of science by different people around the world. The first instrument that is known in the history of computers was called Abacus.

Abacus: The literal meaning of Abacus is board or calculating table. Sometimes around 750 BC The Egyptians made this table of rectangular frame with rods & a divider as shown in Fig 2.1. The rods were having beads of different colors for counting. Hindus in India made the similar structure on sand & Greeks made it on the stones or slabs. The Chinese later perfected the Abacus.
There were total 10 columns. Moving the beads sideways-performed addition or subtraction. The place value of the digits of the numbers & position of beads helped in calculation process.

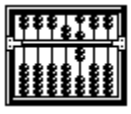
Fig 2.1 Abacus

Napier's bones: John Napier (1550-1617 A.D.) developed the idea of logs to transform multiplication problem to addition problem. The idea of logarithms later became the basis of the invention that is popularly known as the Slide rule. The Slide rule was invented in 1662. Napier also developed some set of rods for helping in multiplication. The reason of calling the invention as Napier Bones is that the rods were made of Bones.

Pascal's adding Machine: (1642 A.D.) A French mathematician Blaise Pascal invented a machine in 1642 for adding numbers. The characteristic of addition was the speed with which it

was done. So the machine was named as adding machine. For addition & subtraction it worked on clockwork mechanism principle. The adding machine consisted of numbered toothed wheels. Each tooth was having a unique position value. The rotation of wheels controlled the addition & subtraction operations. Carry-transfer was also done automatically in this.

Gottfried Leibnitz's Calculator (1673 AD): A German mathematician, Gottfried Wilhelm Von Leibnitz (1645-1716 AD) improved Pascal's Adding machine. Now it was able to do the multiplication & division as well. The multiplications & divisions were performed through repeated additions & subtractions respectively.
Instead of wheels Leibnitz used stepped cylinder with nine teeth of varying lengths. It can also perform some other calculations like square roots etc.

Marie Jacquard's Loom with Punched Cards: A French weaver involved in designing clothes & making patterns or designs on clothes invented punched cards with holes to make beautiful designs. It was in 1801 AD when American Revolution was at its end. The presence or absence of a hole in the punched card represented two states for raising or lowering of the thread on the cloth. The whole process of weaving became automatic because punched card was storing information in the form of holes. This gave the idea of storing & retrieving information, which greatly influenced the future researchers in the field of computing.
Punched cards were in common use till 1990.

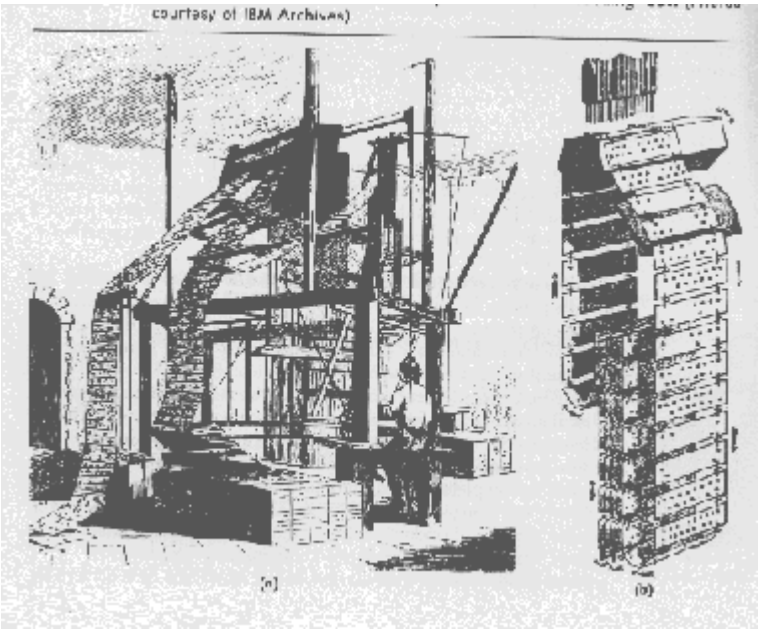

Fig 2.2 Jacquard's Loom

Babbage's Difference Engine (1822 AD): An English Professor of Mathematics Charles Babbage developed a Mechanical machine with the name Difference Engine. The machine was able to calculate various mathematical functions like logarithms, polynomials & algebraic. The precision in calculating these functions was quite good. It was giving the results up to 20 decimal places.

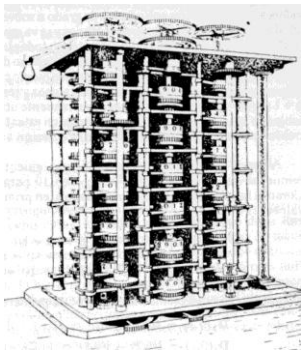

Fig 2.3 Babbage's Difference Engine

Babbage's Analytical Engine (1833 AD): This was the machine that never became operational. But the idea & design of the machine given by Charles Babbage has some of the concepts being used in modern day computers. For this reason He is also called the Father of Computers. The meticulous & methodical design of the Analytical engine has the capability to perform comparisons. The features like Central processor, storage area, memory & input-output devices were incorporated in the design. It also has the capability to follow some machine sequences. The most fascinating of all was the permission to change the numbers & instructions already stored in the machine. The programs were to be stored in punched cards to be read by the machine. Lady Augusta Ada Lovelace helped Babbage in organizing the programs into the analytical machine concept. So she is also called as the First Programmer.

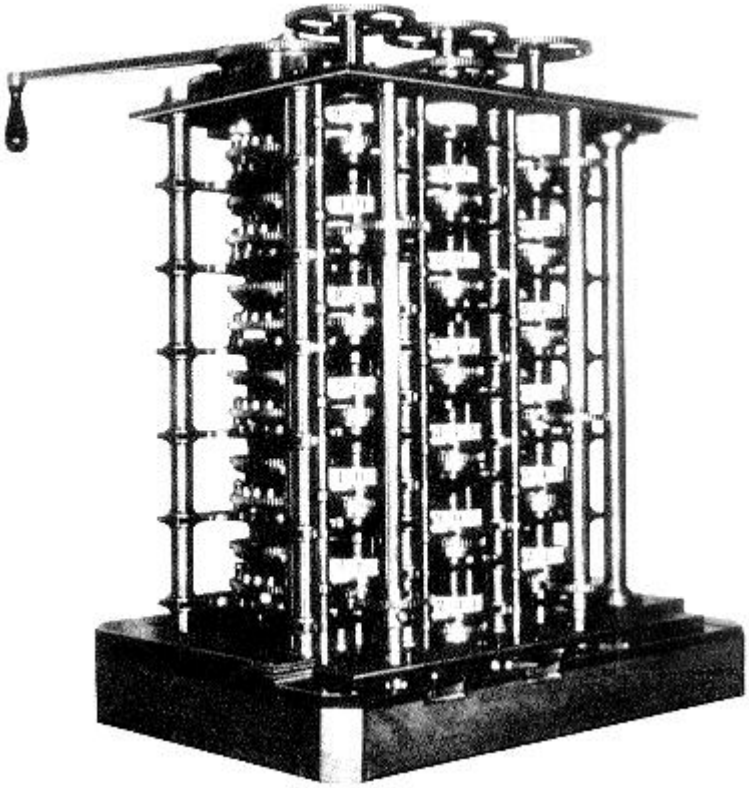

Fig 2.4 Babbage's Analytical Engine

Herman Hollerith's Card Reader (1877 AD): An American Statistician Herman Hollerith, working in the department of Census fabricated the dream of Charles Babbage. He was annoyed at the time taken to calculate & organize the data of a census. It generally took around 10 years to calculate the data by which time the next census became due. By his efforts he developed the machine & used it for census data calculations. The data was now calculated in three years instead of 10 years. He used punched cards for input, output & instructions.
Hollerith founded a tabulating machine company that later merged with others to become the IBM (International Business Machines Corporation), one of the biggest companies in the field of computers.

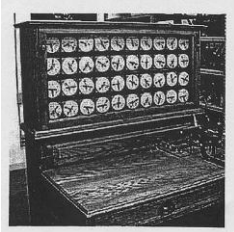

Fig 2.5 Hollerith's Card Reader

Mark-I (1937 to 1943 AD): With the help of IBM Engineers Prof. Howard Aiken (1900-1973) constructed a computer named Mark-I. This could multiply numbers in seconds, which was a record at that time. It was first electromagnetic computer that could calculate according to pre-programmed instructions automatically without any need of human intervention.
It was a huge machine and occupied several rooms. The inside of the computer had the electrical wires that were hundred miles long. Several electromechanical relays & mechanical counters were used for arithmetic calculations.

Fig 2.6 Mark I

ENIAC: (1946 AD) this was the first electronic Computer developed by a team lead by Prof. Eckert and Mauchy at the University of Pennsylvania in USA. Electronic Numerical Integrator And Calculator called ENIAC used vacuum tubes as switching devices. It was having around 18,000 Vacuum tubes, 70000 registers, 10000 capacitors and 600 switches. It used 150,000 watts of electricity & cost $ 400,000. It occupied around 5000 square feet of space. It took around 200 microseconds for addition & 2800 microseconds for multiplication. US army used it until 1955 to calculate the trajectories of missiles & other mathematical calculations. Instructions were given to the computer by External Plug Boards or switches.


Fig 2.7 Mark I

EDVAC (1949 AD): By this time the binary number system was invented. So now it was simple to store in binary numbers instead of decimal numbers. Electronic Discrete variable automatic computer known as EDVAC also used the Von Neumann Architecture. This architecture advocates the concept of pre-stored instructions as programs. With this the operations became faster then before.

EDSAC (1949 AD): Prof. MV Wilkes working at Cambridge University built Electronic Delay And Storage Automatic Computer known as EDSAC. It used Mercury delay lines for storage. It also used binary number system & Von Neumann Architecture. This allowed easy implementation of loop structures in programs.

UNIVAC (1951 AD): Universal Automatic Computer known as UNIVAC was the first commercial computer developed by UNIVAC division of Remington Rand Company. It was used by General Electric besides other big companies. Initial applications of computers were in Science & Engineering where the calculations to be done are enormous.

IBM 650 (1955 AD): This computer made IBM as the leader in the field of computers. Thomas Watson, son of the IBM founder was responsible for introducing this computer with the help of IBM Engineer's.

IBM 700 Series (1955 AD): IBM 701,IBM 702 and IBM 703 were some of the computers from IBM 700 series. Each was having minor improvements from its predecessor but there was no major change in the design or technology being used.

After this many companies were involved in the manufacturing & development of computing machines. The computers gained the interest of the scientific community as a major tool for solving & performing various applications in different aspects of life. So there were thousands of models of different computers given by different companies in different countries. Instead of Discussing Each of them, they had been divided into five generations based on major changes in technology & design of computers.

First Generation (up to 1954): All the electronic computers described above are part of the first generation of computers. It started with ENIAC as the first electronic computer.
Major characteristics of the computers belonging to first generations were.

1. The computers used Vacuum Tubes.
2. The size of the machines was huge.
3. The speed of processing was very slow.
4. The space taken was too large.

5. The computers were very costly
6. Difficult to manufacture
7. Programming was very difficult
8. It was very difficult to remove the errors.
9. The computers were having all the components like Input, Output, CPU like the modern day computers
10. The use of these computers in Industrial or Commercial Sites was very less.
11. The scope of computers was thought to be in calculating the difficult calculations & doing the complex arithmetic.
12. Power consumption was more & the computers radiate a lot of heat.
13. Punched cards were used for Input & Output.
14. Only Machine level or Assembly language was used.

Fig 2.8 Vacuum Tubes

Second Generation (1955-1964)
IBM 1401(1958), IBM 1620(1960), IBM 7090(1960), IBM 7094(1961), IBM 7094I(1962), IBM 7094 II (1964), Control Data Corporation's CDC 1604(1961), CDC 3600(1964), Digital data corporation's PDP 1 (1957), PDP 5 (1963), PDP 8 (1965), UNIVAC 1108(1965) mare all examples of the second generation computers.

1. These computers were using transistors for CPU components & ferrite cores for main memory.
2. As Transistors replaced the Vacuum tubes, so the size decreased as compared to First generation computers.
3. The performance of the computers increased because transistors consume one tenth of the power as compared to Vacuum tubes & generate less heat.
4. These used magnetic disks, Magnetic tapes & drums for secondary memory. Memory capacity was up to 100 Kilobytes (1 Kilo Byte= 1024 Bytes).
5. Floating point arithmetic was widely used in all these machines.
6. Use of High Level Languages Like FORTRAN, ALGOL & COBOL started in these computers.
7. The processing speed increased.
8. These were all batch processing systems.
9. The Computers were widely used in Science & Engineering Applications apart from many commercial applications.
10. New Professions like Programmers & system Analysts emerged during this period.
11. Academic programmes in computer science were started during this period.
12. Concept of operating system started evolving.

Third Generation Computers (1965-1974)
IBM/370 series (1970), CDC 7600 (1969), PDP 11(1970), ICL-2900 series (1968), Honeywell 6000 series, CYBER-175, STAR-100 are all examples of the third generation of computers.

Fig 2.9 PDP 11

The major characteristics of these are:

1. Instead of Transistors ICs (Integrated Circuits) were used for internal operations of CPU. Use of ICs eliminated wired interconnection between components. Initially these were using Small Scale Integrated Chips (SSI) that was having around 10 transistors per chip. In the later years computers were using Medium Scale Integrated Chips (MSI) that were having around 100 transistors per chip.

Fig 2.10 Chip

2. Semiconductor memories were used. So the memory capacity increased both at primary & secondary memory level. Memory capacity was now up to 100 Mega Bytes (1 Mega Byte = 1024 Kilo Bytes).
3. Concept of cache memory was also incorporated in third generation of computers.
4. There was further reduction in size & cost.
5. The reliability, efficiency & speed increased as compared to its predecessors.
6. Data Base Management Systems Emerged.
7. Business applications were now quickly moving towards automation.
8. Many Interactive Systems became feasible.
9. Mainframes were the highlights of this generation.
10. The CPUs were now able to carry 1 million instructions per second.
11. Multiprocessing, timesharing, multiprogramming systems were introduced.
12. Concept of networking evolved.

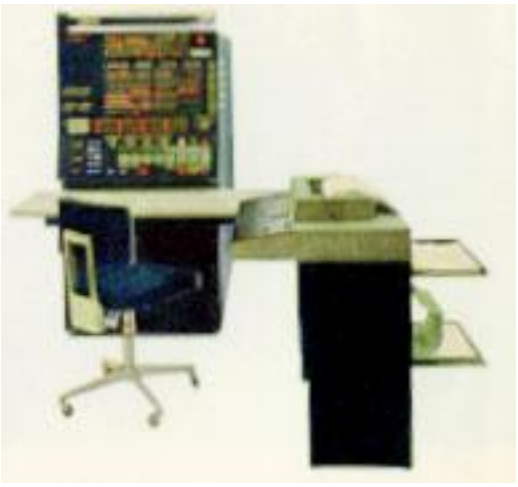

Fig 2.11 IBM 370

Fourth Generation Computers (1975-2002)

Motorola 68000 series, Intel Series, IBM 3090/600 (1988), IBM ES/9000(1996), VAX 8842(1988), HP 9000 Series, CRAY Y-MP (1988), IBM Deep Blue (1998), IBM PC/XT (1982), IBM PC/AT (1984), IBM PC/AAT (1986) are some of the examples of the Fourth generation computers.

The major characteristics of these are:

1. There were rapid improvements in the chip technology. In the initial years instead of MSI these computers used Large Scale Integrated chips that were having around 1000 transistors per second. In the late 80s these computers were using Very Large scale integrated chips that were having around 5000 transistors in a chip. The emergence of processor on a single chip has further increased the number of transistors on a single chip to around 500000.
2. The input & output devices like floppy disk, compact disk, video disk, touch screens, scanners, digital cameras, web cameras, highly improved printers became very common.
3. The size of the primary memory & secondary memory increased many fold. With improvements in the storage devices now hard disks are most popular media for storage. Now the size of the memory is up to 100 Giga Bytes (1 Giga Byte = 1024 Mega Bytes).
4. Separate processors are used for different processes like I/O processor, graphics processor etc.
5. Concept of distributed processing, parallel processing evolved.
6. Extremely powerful personal computers are now part of every home. Multimedia workstations emerged.
7. The size & cost of the Computers is continuously decreasing. The laptops & handheld computers are the examples of the miniaturization in computer of fourth generations.
8. Supercomputers are having the speed up to 1 billion instructions per second.
9. The way we do programming has also changed. In the initial years with the C language programming methodology changed to structured methodology. In the later years with C++ & Java now we are using object-oriented languages. Many interactive languages like Visual Basic, Visual C++, and Visual Age for Java also became popular.
10. Advanced databases incorporating Distributed databases concepts & having user-friendly graphical menus became prevalent.
11. With advancements in Communication technology & the coming of Internet computers changed the way of life. The way of doing businesses has changed. The concept of digital firm is evolving.

12. With the help of Fiber Optics networks the transmission speeds & quantity of data increased. It became possible to send Audio & Video as data.

Fig 2.12 Multimedia System

Fifth Generation Computers

The Characteristics of these computers will be

1. Fifth generation computers will use Ultra Large Scale Integration Chips That will have millions of transistors on a single chip.
2. The speed of the doing computations will be around 1 trillion per second.
3. The memory size will go up to 100 Terra Bytes (1 Terra Byte = 1024 Giga Byte).
4. Many of the advanced countries are doing the projects related to this. Sample systems have already been prepared. These Computers will have Artificial Intelligence, so they may also be called as Expert Systems.
5. These Computers will have intelligence like human beings & will incorporate knowledge-based problem solving skills.
6. The input to these systems can be through speech & graphics. Similarly the output can be taken as speech.
7. These computers will be able to understand natural languages & will be able to convert one language from another language.
8. These computers will become more intelligent by time because they will have self-learning techniques.
9. Genetic Programming, Biotechnology, Biochips, Human like Robots will be the technologies that will evolve.
10. The computers will be part of mobile phones, handheld devices like watches etc.

Types Of Computers

Mechanical Computers: These computers were the computers of the old era that were operated mechanically. Analytical engine, Pascal's machine and Difference engine explained above are some of the examples of mechanical computers. These were the machines that made the modern digital electronic computers possible.

Electronic Computers: The first popular electronic computer was ENIAC. After that we are having all the computers as electronic computers. The speed of the electronic computers is increasing day by day. Initially these computers were using valves and then use of transistors became prevalent. After that it was the turn of semiconductor chips. Now we are using VLSI chips in electronic computers.

Analog Computers: The principle on which analog computer work is different from that of digital computers. These work inputs of continuously varying electrical voltages. Data & calculations are also in the form of voltages, current and temperature etc. Voltmeters,

Ammeters are some of the devices that measure these things. The analog computers are faster because they do calculations in parallel but there are chances of error. Many scientific & engineering types of equipment are analog based. You can see many of the equipments in the labs of engineering colleges & universities.

Digital Computes: The digital computers convert the data into binary digits & then do all the processes. The data is discontinuous. The speed of the digital computers is very fast & increasing further. The accuracy is more than analog computers. There is no branch of life where we are not using digital computers.

Hybrid Computers: Hybrid computers use both analog & digital techniques in optimized way. Many machines that work on some data to be collected from physical quantities work on analog principle but the interface with the operator or the user is through the digital principle.
Most common example can be found in hospitals. Analog part measures the heartbeat and the digital part is used to get the commands from the doctor & interact with the doctor. Hybrid computers are designed for the specific purpose.

Mainframe Computers: These computers are used where the transactions to be performed on the same data are large in numbers. Mainframe computers are best in handling the large databases. These are used in large corporate houses, banks, insurance companies, Govt. offices, defense and airline industry.
The historical mainframe computers used to be of size of an entire room. They need air conditioning & other necessary infrastructure setup to operate smoothly. But the mainframes of today are no more different then a typical workstation. Now it is hard to differentiate between a mainframe computer & other computer based on the size only.
Mainframe systems are very costly. As per their functionality also they are out of the domain of the common man. One mainframe system can support many users around the world working on the same data at the same time. The number of users a particular mainframe can support can vary from few hundred to thousands. These use concepts of Distributed database management system & parallel processing. Integrity & security of data are the key features that have to be taken care.

The main applications that uses Mainframe computers are in payroll processing, customer order processing, banking transactions, census operations, airline reservation systems, railway reservation systems, government administration and library management.

IBM 4300 series, IBM 308X series, IBM 3090 series, IBM 9000 series, IBM S/370, IBM S/390 and HP 9000 series are some of the popular mainframes of computer era.

Mini Computers: IBM AS/400,VAX 8842,WIPRO 68030, HCL Magnum, IBM 9370 series are some examples of the mini computers. Minicomputer are also called mid range computers. The size of the mini computers was small as compared to their contemporaries in early 1970's. They fall in between the mainframe & personnel computers with respect to the performance, cost & size.
Most of the minicomputers are designed to act as servers in the labs which are having many terminals connected to each other in the network. These minicomputers serve the network sharing needs of the user. Now the days the scalable mini computers are being used as web servers with different memory requirements of different users. The cost of the minicomputers is less as compared to the mainframes, but still these are out of the range of common man.

The applications of the mini computers are in the field of file sharing, graphics intensive work, 3D simulations and sophisticated games besides other General-purpose applications.

Super Computers: As the name suggests these are the best of all computers in terms of speed & performance. These computers are very costly & occupy largest of the physical space as compared to others. The latest Supercomputers can perform around 5 trillion calculations per second that is near impossible for the human mind. The memory capacity of some of the Supercomputers is also to the tune of many Terra Bytes. The supercomputers are using the latest techniques like parallel processing, Vector Processing, Pipelining, Distributed Processing etc. CRAY series of supercomputers were very popular. Some of the initial CRAY computers consisted of around 64 or more number of parallel processors working in the same unit & currently the number of processors in the CRAY computers has gone to thousands. We can imagine the fast pace & growth of technology in a small span of time.

The applications of Supercomputers are in those areas where the amount of data to be processed is huge. It performs lengthy & complex calculations involving hundreds of parameters in seconds.
Supercomputers are not for the common man & are used for very specific purposes. So you can see the supercomputers only in Research labs of large corporations or in Govt. offices or in big Universities. Currently supercomputers are being used in Weather Forecasting, Space Exploration, measuring pollution, Global Information Systems, Biotechnology, Defense, astrophysics, modeling & simulation, designing of aircrafts, Nuclear & atomic research, oil exploration, seismology, fluid dynamics and cryptography.

Still the supercomputers are not able to solve some of the complex problems of the world; the scientists are facing. So the demand for even faster computers is growing. The companies are involved in these projects. These companies are spending millions of dollars on the research. IBM is the leader in Supercomputers. Hopefully in next five years we will have supercomputer that can perform 100 trillion instructions per second.

The research is now being done in complex areas because of the tools available for analyzing & calculating the data with the help of supercomputers. The calculations that may have taken 20 years to perform by hand can now be done in seconds. It is due to this that scientists are now able to do the research at finer levels. Now it has become possible to collect data about all the Genes of Humans that consists of millions of pages of information.
The atomic explosions that were being carried out to develop the military strength of a country are now simulated on Supercomputers.

Some of the best supercomputers of the world
With the time the capacity & power of supercomputers is increasing beyond our imagination.

Some of the best supercomputers are being developed in Linux that include more than 600 IBM xSeries eServers running Linux and Myricom's Myrinet cluster interconnect network.

Deep Blue, CRAY1, CRAYT3E and CRAY SV1 are some of the supercomputers in the world.

Fig 2.13 CRAY SV1

Workstations: Workstations are often designed with specific applications in mind. The companies are providing scalable architecture workstations for fulfilling the specific demands of the customers. If a civil Engineer wants a workstation for designing with the latest software using high end graphics & 3D simulation then the workstation will have the powerful graphic processors besides other configuration matching the customer needs. The workstations are always more powerful then a typical computer in terms of storage capacity and processing speed. Some of the personnel computers of today are more powerful then the older workstations. This demonstrates the changing requirements of different levels of society in terms of computer memory & speed.

Fig 2.14 Workstation

Personnel Computers (PCs): when anyone uses the term **personal computer**, **microcomputer** or **desktop computer** that means the small computers that are used in offices, homes or classrooms.

These are called personal computers because they fulfill the needs & requirements of an individual. These are called desktop because they can be fitted on to a single desktop. These are called microcomputer because they generally have a single microprocessor chip that performs all the functions of a CPU. These systems come in various sizes, shapes & color. Different system have different configuration depending upon the individual needs.

The applications of PCs are in word processing, Accounting, Education, Database management, managing small businesses, Health, Painting, communication and playing games etc.

The term started with IBM shipping its product in 1981 named as PC. So some associate Personal computers with IBM till now. But after that everyone cloned or shared the concept of IBM & made their products. The cost of the personal computers is very low & is going low with passing of every year. These systems are now easily affordable by the masses. Users can choose from the different models from different companies.

Laptop Computers: These are similar to Personal computers in terms of performance but they differ only in their size. The power requirements of a laptop computers are very less so they can work on small batteries for a longer period. These are also called portable computers due to their small size. These can fit in to a small bag & can be carried with while traveling. These are very useful for the managers of the multinational companies and for the marketing persons because they need to travel to different places most of the time. The cost of the laptops are higher then a PC but are still in the affordable range. These will further go down in the near future.

Fig 2.15 Laptop computers

Handheld Computers: These are the computers that are of very small size & can be carried in your pocket. These are called handheld computers. Personal Digital assistants, Mobile phones with Internet facility, High-end calculators, palmtop computers and personal organizer are all under this category.
These computers may not have the power equivalent to a PC but these are very handy for performing small tasks when you are on the move. These devices have a fair amount of memory and also good processing speed. These systems are evolving very fast & everyone will be carrying a handheld computer in the very near future. The main works which are done on these devices are to manage the addresses & contact information, send Fax & E-Mail, read & move data, word processing tasks, Schedule management, preparing a presentation, monitoring & communication.

Fig 2.16 Handheld computers

Wearable Computers:

It is a computer that is part of the user always even while walking or doing any other activity. These computers can be part of your jacket or glasses or belt or anything else that you wear.
Several wearable computers are already in the market. Wristwatch computers, Pocket computers with display in the glasses are already popular. After ten years we all will be wearing the computers as part of our dress code.

Fig: 2.17 Wearable Computers

Multiple-choice Questions:

1. The First Instrument known in the history of computers was _____.
   a) Pascal's adding machine b) Napier's bones
   c) Abacus d) Analytical Engine

2. Punched cards were used for the first time in _____.
   a) Jacquard's Loom b) Difference Engine
   c) IBM 360 d) PDP 11

3. The person who is known as the father of computers is _____.
   a) Herman Hollerith b) Charles Babbage
   c) Blaise Pascal d) Vonn Neumann

4. The Application of Herman Hollerith's card reader was in the field of _____.
   a) Census b) textile
   b) Inventory c) Defense

5. ENIAC was the first _____ computer.
   a) Hybrid b) Mechanical
   c) Handheld d) Electronic

6. First Generation Of computers used _____.
   a) Vacuum Tubes b) Transistors
   c) LSI Chips d) VLSI Chips

7. Third Generation of computers used _____.
   a) Vacuum Tubes b) Transistors
   c) LSI Chips d) VLSI Chips

8. Use of high-level Languages like FORTARN & COBOL started in _____of computers.
   a) First Generation b) Second Generation
   c) Third Generation d) Fourth Generation.

9. Pentium based Machines belong to _____Generation of computers.

a) First b) Second
c) Third d) Fourth

10. The characteristics of the fifth generation of computers are _____.
    a) Human like intelligence b) Input through Voice
    b) Memory size in terra Bytes d) all of the three

11. IBM 390 comes under the category of _____ Computers.
    a) Hybrid b) Mainframe
    c) PCs d) Laptops

12. Most widely used computers are _____.
    a) Hybrid b) Mainframe
    c) Microcomputers d) Laptops

13. One of the examples of handheld computer is _____.
    a) Mark-I b) Palmtop
    c) ThinkPad d) STAR-100

14. Supercomputers are not meant for use in _____.
    a) Weather forecasting b) Space Exploration
    d) Nuclear & atomic research d) Inventory Application

15. _____ are used for specialized tasks or applications.
    a) Personal Computers b) Laptops
    c) Workstations d) Minicomputers

16. One of the super computers designed by INDIA is
    a) CRAY b) PARAM
    c) Fujitsu d) Deep Blue

17. Portable computer out of the following is
    a) Supercomputer b) Mainframe
    c) Minicomputer d) Laptop

18. One of the following is not a computer company
    a) IBM b) HP
    c) Microsoft d) ENRON

19. With the time speed & storage of computer is _____.
    a) Decreasing b) increasing
    c) Constant d) none of these

20. With time cost & size of the computer is _____.
    a) Decreasing b) increasing
    c) Constant d) none of these

Review Questions

1. Explain the following terms
    a) Supercomputers
    b) Mechanical Computer
    c) Charles babbage's Analytical engine
    d) Hand held computers
    e) Abacus
    f) Workstation
2. Make a table for displaying the differences in characteristics of various generations of computers.
3. What are handheld computers? How useful they are.
4. Who gave the concept of today's computer? What were the components of the basic design of a computer?
5. Make a list of companies & their products. Find out the companies who had played a significant role in the development of computers.

Discussion questions

1. List all the computers in your organization. Find out the generation they belong to. Are these computers being used for the right kind of application?

2. Which factors contributed to the progress of computers?

3. What is the future of the computer technology? What types of computers will be developed in the future. Which applications these will support.

Answers to Multiple Choice Questions:

1. c
2. a
3. d
4. a
5. d
6. a
7. c
8. b
9. d
10. d
11. b
12. c
13. b
14. d
15. c
16. d
17. d
18. d
19. b
20. a