



# INTRODUCTION TO COMPUTER

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BY KAJOL RAMTEL



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- The computer is derived from the Latin word 'computerae' which means 'to compute'. The full form of the Computer is **Commonly Operating Machine Purposely Used for Technological and Educational Research. ()**

- A computer is an electronic device, operating under the control of instructions stored in its own memory that can accept data (input), process the data according to specified rules, produce information (output), and store the information for future use.

## 4 FUNCTIONS OF COMPUTER

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- Input
- Processing
- Storage
- Output

## 5 CHARACTERISTICS OF COMPUTER

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1. Word Length
2. Speed
3. Accuracy
4. Diligence
5. Versatility
6. Storage
7. Automatic



## 6 CHARACTERISTICS OF COMPUTER

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- **Word length**
  - The number of bits (a binary digit is called a bit) that a computer can process at a time is called word length
  - Word length of the computer varies such as 8, 16, 32 or 64 bits.

## 7 WORD LENGTH

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- It is the measurement of the computing power of the computer i.e. longer the word length, the more powerful the computer is.
- What do you mean by a 64 bit computer?
  - It means that the word length of a computer is 64 bit i.e. the computer can process 64 bits of data at a time.

## 8 CHARACTERISTICS OF COMPUTER

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- **Speed**

- As you know computer can work very fast. It takes only few seconds for calculations that we take hours to complete. You will be surprised to know that computer can perform millions (1,000,000) of instructions and even more per second enabling the users to take right decisions at right time.
- Speed measurement of computer :-



## 9 CHARACTERISTICS OF COMPUTER

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Units of time	Part of second	
Milliseconds (ms)	One thousands	1/1,000
Microseconds (Hs)	One millionth	1/1,000,000
Nanoseconds (ns)	One billionth	1/1.000,000,000
Picoseconds (ps)	One trillionth	1/1,000,000,000,000

## 10 CHARACTERISTICS OF COMPUTER

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- **Accuracy**

- The degree of accuracy of the computer is very high and every calculation is performed with the same accuracy. The accuracy level is determined on the basis of design of computer. The errors in computer are due to human and inaccurate data which is also referred to **Garbage In Garbage Out(GIGO)**. It means that if you enter incorrect data to the computer and have it processed, the computer will provide the misleading information.

# II CHARACTERISTICS OF COMPUTER

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- **Diligence**

- A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without creating any error. If millions of calculations are to be performed, a computer will perform every calculation with the same accuracy. Due to this capability it overpowers human being in routine type of work.

- **Versatility**

- It means the capacity to perform completely different type of work depending upon the instructions fed into it. You may use your computer to prepare payroll slips. Next moment you may use it for inventory management or to prepare electric bills.



## 12 CHARACTERISTICS OF COMPUTER

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- **Storage**

- Computer has the power of storing any amount of information or data. Any information can be stored and recalled as long as you require it, for any numbers of years. It depends entirely upon you how much data you want to store in a computer and when to lose or retrieve these data.
- The Computer has an in-built memory where it can store a large amount of data. You can also store data in secondary storage devices such as Magnetic disks, Magnetic tape, optical disks, which can be kept outside your computer and can be carried to other computers.
- The storage capacity of computer is measured in terms of kilobyte (KB), megabyte (MB), gigabyte (GB) and terabyte (TB) etc.
- The smallest unit is bit, and the unit of 8 bit is 1 byte.





# 13 CHARACTERISTICS OF COMPUTER

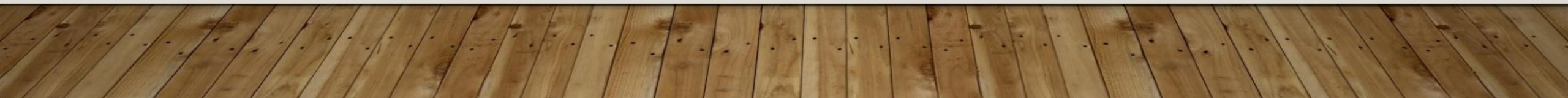
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- **Automatic**

- Once the appropriate set of instruction are provided to the computer, it is capable of functioning automatically.
- It is automatic machine because it performs work without the intervention of the user. User needs to give data and utilize the results but process is automatic.

*(Explore more characteristics on your own)*

***Q. List some of the limitations of the computer?***





# 14 APPLICATIONS OF COMPUTER

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1. Home
2. Medical Field
3. Entertainment
4. Business
5. Education
6. Marketing
7. Banking

**(Explore More)**

# 15 APPLICATION OF COMPUTERS

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## 1. Home:-

There are enormous benefits we can get from using computers at home. From entertainment and communication to education and productivity computers play significant role to ease us. We can play games, watch movies, use social medias, work from home, learn new skills online, chat with friends, pay bills, browse internet, do online shopping etc. We can tour the world from our ease, comfort and convenience of our home.

# 16 APPLICATION OF COMPUTERS

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## **2. Medical Field:-**

Computers are used in hospitals to maintain a database of patients , doctors, medicines and treatments. It is also used for the scanning and diagnosing of diseases. History diagnosis, X-rays, live monitoring of patients, ECG, EEG, ultrasounds, CT scans etc. are also done by computerized machines.

## **3. Entertainment:-**

Computers help to watch movies online, play games online; act as a virtual entertainer in playing games, listening to music, etc.



# 17 APPLICATION OF COMPUTERS

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## 4. Education:

Computers have its dominant use in the education field which can significantly enhance performance in learning. Even distance learning is made productive and effective through internet and video-based classes. Researchers have massive usage of these computers in their work from the starting to till the end of their scholarly work.

## 18 APPLICATION OF COMPUTERS

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### 5. Business

A computer has high speed of calculation, diligence, accuracy, reliability, or versatility which made it an integrated part in all business organizations. Computer is used in business organizations for: Payroll calculations, Sales analysis, Budgeting, Financial forecasting, Managing employees database and Maintenance of stocks etc.



## 19 APPLICATION OF COMPUTERS

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### 6. Marketing

In marketing, uses of computer are :

**Advertising** - With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.

**Home Shopping** - Home shopping has been made possible through use of computerized catalogues that provide access to product information and permit direct entry of orders to be filled by the customers.



## 20 APPLICATION OF COMPUTERS

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### **7. Banking**

Today banking is almost totally dependent on computer. Banks provide the facilities of:

Banks provide online accounting facility, which includes current balances, deposits, overdrafts, interest charges, shares, and trustee records.

ATM machines are making it even easier for customers to deal with banks.

## 21 GENERATIONS OF COMPUTER

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- Generation of computer refers to the specific improvements in the computer technology, advancement in the hardware technology or development of the computers that took place over a span of time.
- In each new generation, the circuits became smaller and more advanced than the previous generation circuits. The miniaturization helped increase the speed, memory and power of computers.
- There are five generations of computers which are described below;



## 22 FIRST GENERATION COMPUTERS (1940S-1950S)

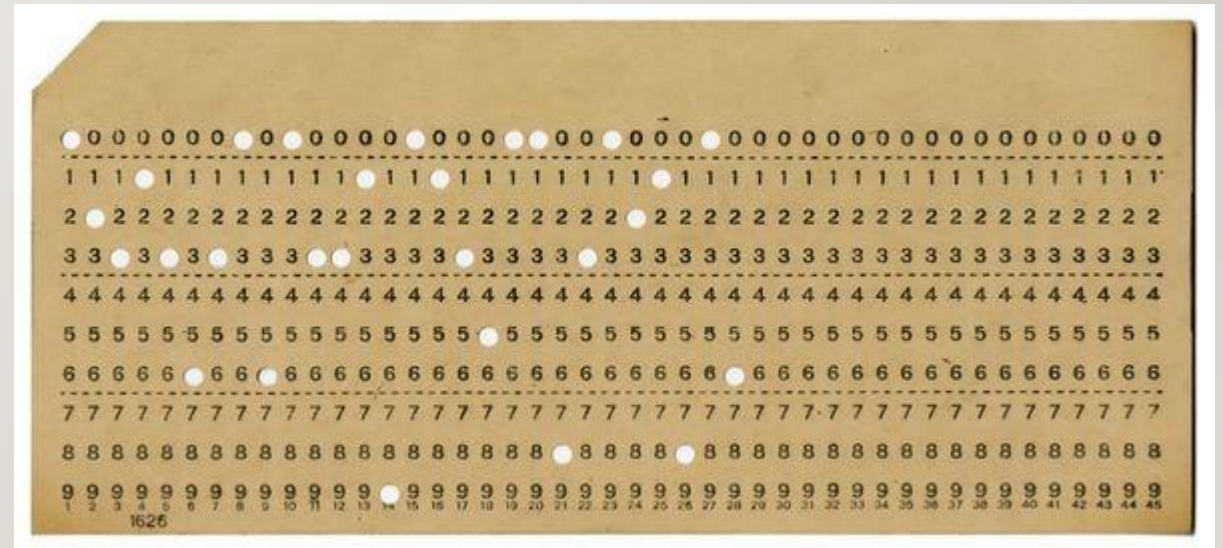
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- Vacuum tubes were the basic and main components of the CPU.
- These computers were mainly depended on batch operating system.
- punch cards and paper tape were used as output and input devices in this generation.
- Magnetic tape were used for the storage. Computers were slow, huge and expensive. Examples: ENIAC, UNIVAC.



## 23 FIRST GENERATION COMPUTERS (1940S-1950S)

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## 24 SECOND GENERATION (1950s-1960s)

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- The transistors were the main electronic components. These computers used transistors which were cheap, compact and consuming less power; it made second generation computers faster than the first generation computers.
- Generated less amount of heat but still required air conditioning.
- Punched cards and printouts were still used for input and output.

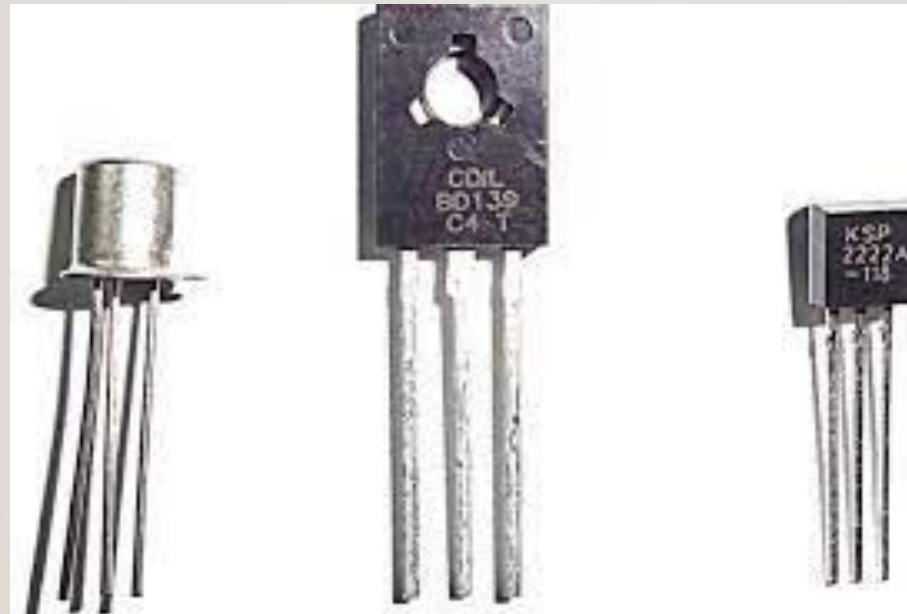
## 25 SECOND GENERATION (1950s-1960s)

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- Magnetic cores and Magnetic disks was used for storage.
- Still batch processing system was used but the processing speed change from milliseconds to microseconds.
- Assembly language and programming languages like COBOL and FORTRAN, and Batch processing and multiprogramming operating systems were used in these computers.
- Examples:- IBM 1401, ICL 2950/10

## 26 SECOND GENERATION (1950s-1960s)

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## 27 THIRD GENERATION COMPUTERS (1960S-1970S)

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- Integrated circuits (ICs) were used in this generation instead of transistors. A single IC can pack huge number of transistors which increased the power of a computer and reduced the cost.
- The computers also became more reliable, efficient and smaller in size.
- Less heat production and no requirement of cooling systems.
- Use of keyboard and monitors for input and output



## 28 THIRD GENERATION COMPUTERS (1960S-1970S)

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- Processing speed increased from microseconds to nanoseconds.
- Use of multiprogramming OS like UNIX and MULTICS.
- Examples: IBM 360, NCR 395, etc.





## 29 FOURTH GENERATION COMPUTERS(1980S- PRESENT)

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- Based on microprocessor.
- High speed and large semiconductor memory.
- Processing speed increased to GHZ.
- GUI based operation systems and use of mouse.

## 30 FOURTH GENERATION COMPUTERS(1980S- PRESENT)

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- Multimedia, networking, and distributed computing are introduced.
- Small, highly reliable, portable, cheapest, small amount of energy consumption, easy programming languages, sophisticated softwares were the advantages over other generation computers.
- Examples: Apple II, IBM PCs etc.

### 3 | FIFTH GENERATION COMPUTERS (PRESENT AND BEYOND)

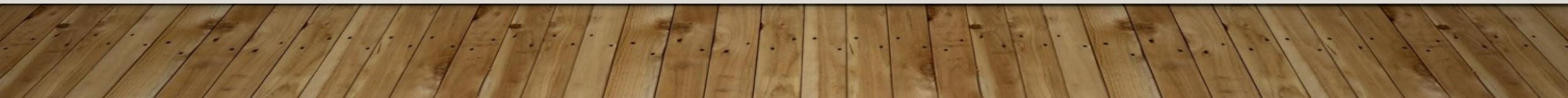
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- Biochips will be used as processing components.
- Speech and graphic images will be used for input and output.
- Solution of high level complex problems with reasoning, intelligence and expert knowledge.
- Intended to cope with natural languages and have capabilities of learning and self organization.

## 32 HISTORY OF COMPUTERS

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- The first counting device was used by the primitive people. They used sticks, stones and bones as counting tools. As human mind and technology improved with time more computing devices were developed.
- Some of the popular computing devices starting with the first to recent ones are described below;





## 33 ABACUS

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- Invented in Babylonia in fourth century BC.
- Used as a simple counting device.
- Early merchants used this device to keep track of trading transactions.

## 34 NAPIER'S BONE

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- It was a manually-operated calculating device which was invented by John Napier (1550-1617) in 1614.
- There were nine different bones that were used to multiply and divide.
- It also became the first machine to use decimal point.

## 35 SLIDE RULE

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- English mathematician William Oughtred invented slide rule in 1622 AD.
- This was used in performing numerical computations such as multiplication, division, powers and roots.
- It was the first analog device.

## 36 PASCALINE

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- Between 1642 AD and 1644 AD a French mathematician Blaise Pascal invented this machine to help his father, a tax collector with his duties.
- It could perform operations addition and subtraction.



## 37 LEIBNIZ MACHINE

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- A German Mathematician and philosopher, Gottfried Wilhem von Leibniz, improved the pascaline by creating a machine that could multiply also in 1694 AD.
- By studying Pascal's original notes and drawings Leibniz was able to refine his machines.

## 38 CHARLES BABBAGE MACHINE

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- It is the real beginning of computers as we know them today.
- An English mathematics professor, Charles Babbage is known as the father of computer.
- He invented mainly two devices:-
  - Difference engine (1822)
  - Analytical engine (1833)

## 39 DIFFERENCE ENGINE

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- In 1822 AD Charles Babbage announced the invention of difference engine.
- It is used to calculate the differential equation.
- It stores programs and perform calculations and print the results automatically.

## 40 ANALYTICAL ENGINE

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- In 1833 AD, Babbage developed another machine called analytical engine which was able to perform any arithmetic operations.
- It's most of the elements are present in today's digital computers. So, Charles babbage is known as the father of computer.



## 4 | ANALYTICAL ENGINE

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- The machine was designed to consist of four components: the mill, the store, the reader, and the printer.
- The mill was the calculating unit, analogous to the central processing unit (CPU) in a modern computer; the store was where data were held prior to processing, exactly analogous to memory and storage in today's computers; and the reader and printer were the input and output devices.



## 42 LADY ADA AUGUSTA

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- Lady Ada Augusta, a disciple of Babbage developed several programs for performing mathematical calculations on Analytical Engine after his demise .
- She is considered as the first programmer in history

## 43 HOLLERITH MACHINE

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- In 1889 and American inventor, Herman Hollerith, applied jacquard loom concept to computing and invented a machine to find a faster way to computer the U.S. census.
- This machine helped census takers to compute results in just six weeks which would have taken 10 years long to complete in absence of this machine.

## 44 ABC (ATANASOFT BERRY COMPUTER)

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- In 1937, John J. Atanasoft and Clifford Berry designed and developed ABC computer.
- It was used for solving linear equation.
- It used 18000 vaccuum tubes.
- It was not programmable.

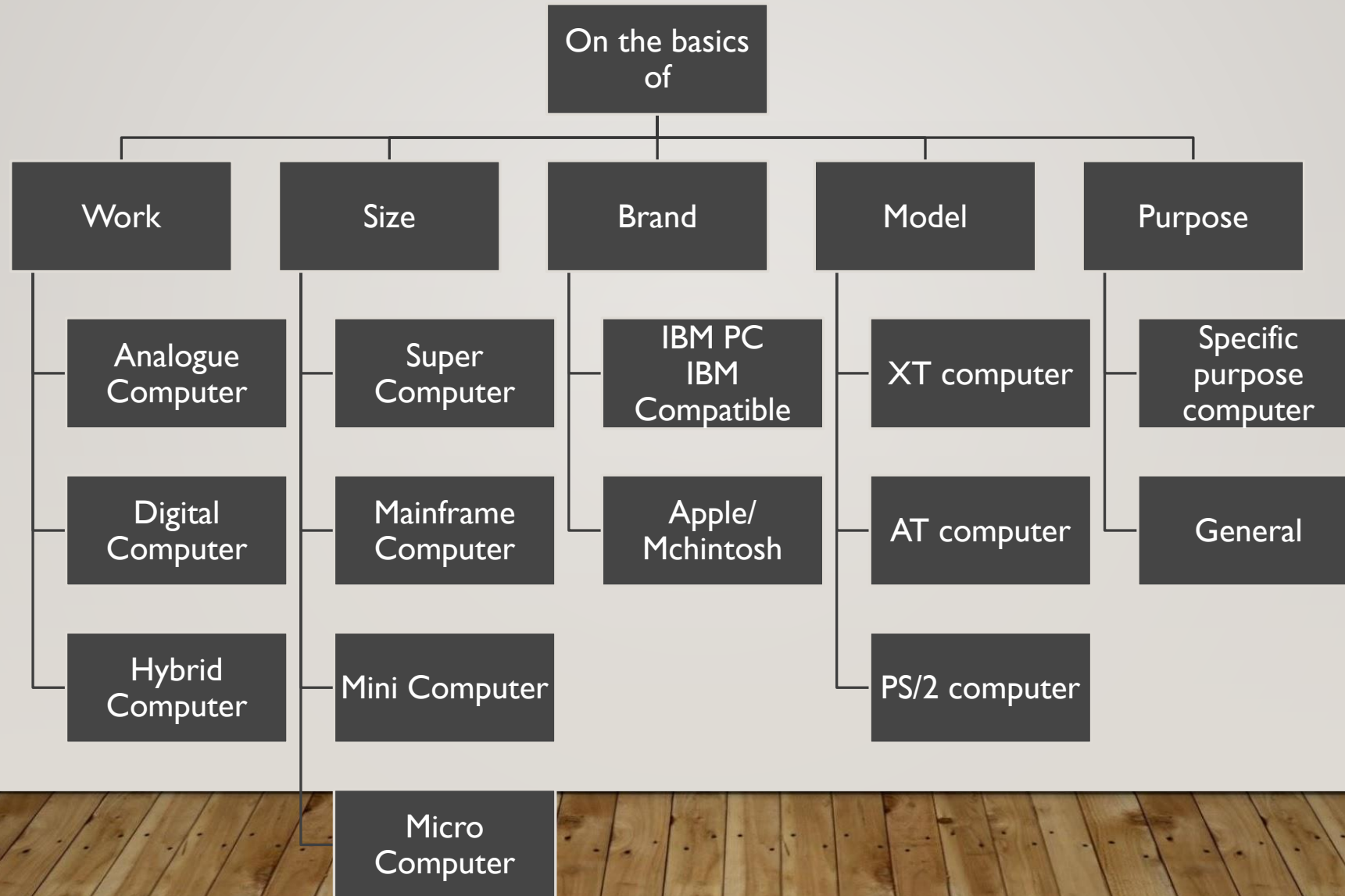


## 45 MARK I

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- In 1944, Howard Aiken completed mark I.
- It was also called Automatic Sequence Controlled Calculator (ASCC).
- It was very large computer and used 18000 vacuum tubes.
- This was the first programmable digital computer made in U.S based on Charles Babbage's principle after 100 years of his death.

# CLASSIFICATION OF COMPUTERS



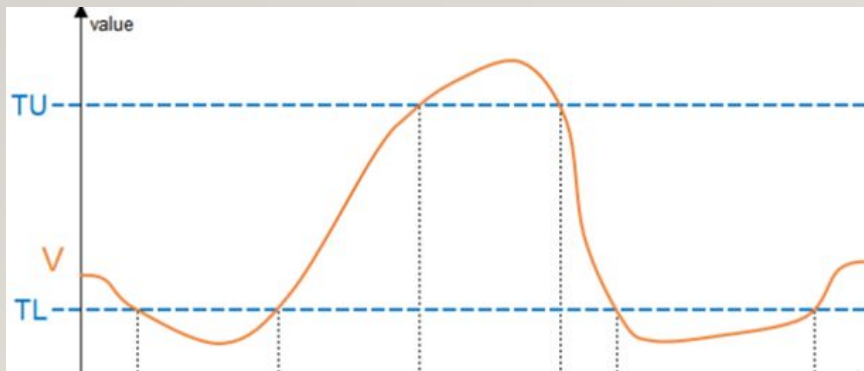
## 47 ON THE BASIS OF WORK

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- Analog Computer
  - Computer that operates on continuous data that are not changeable in nature, like voltage and current is called analog computers.
  - They are special - purpose computer that is one device does a specific task only. So, they are also known as the task specific computers.
  - They are slower, less accurate, less reliable, difficult to use and consume more power than digital computers.
  - Examples: Analog watch, Speedometer, Seismography, telephone lines, analog sound processor etc.

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## EXAMPLES OF ANALOG COMPUTER





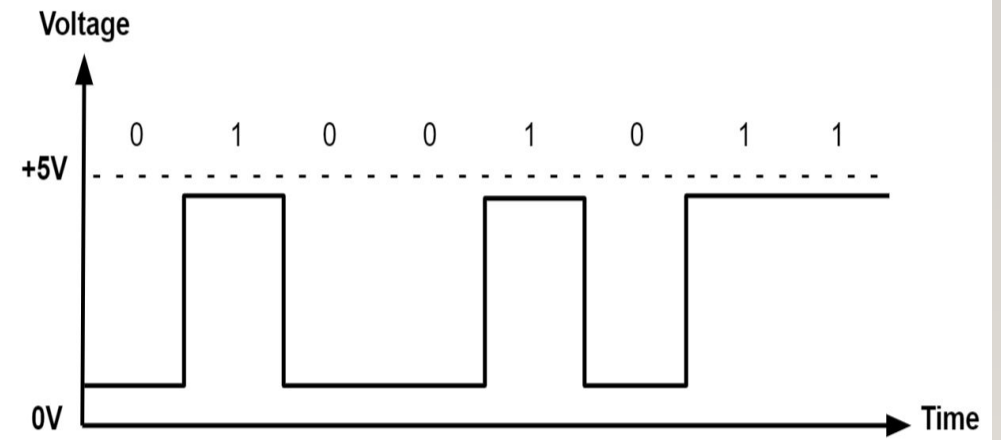
## 49 ON THE BASIS OF WORK

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- Digital Computer
  - Computer that operates on digital signals and work on discrete type of data is called digital computers. It deals with binary digits like 0 and 1.
  - They are general - purpose computer i.e one device can perform multiple tasks. This they can be used for multiple task.
  - They are more reliable, faster, higher accuracy, consume less power and easy to use than analog computer.
  - Example:- Laptop, desktop, smart phones, smart watches, digital watch, calculator etc.



# 50 EXAMPLES OF DIGITAL COMPUTER



## ON THE BASIS OF WORK

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- Hybrid Computer
  - Combines best features of both analog and digital computers.
  - It is used to process both continuous and discrete data.
  - It can convert analog signals to digital and vice-versa.
  - These computers are mostly used in scientific applications, aero planes, jet planes, industries, hospitals etc.
  - Examples:- Monitoring Machines, Ultrasound Machines, ECG, Defense etc.



## 52 EXAMPLES OF HYBRID COMPUTER

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## 53 ON THE BASIS OF SIZE

- Super computer

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  - Supercomputers are the ***biggest and fastest computers***. They are designed to process huge amount of mathematical data that are complex in nature.
  - A supercomputer can ***process trillions of instructions in a second***. It has thousands of interconnected processors.
  - Supercomputers are particularly used in ***scientific and engineering applications*** such as weather forecasting, scientific simulations and nuclear energy research. E.g. : Cray-XMP/14. CDC 205, CYBER 205.
  - The first supercomputer was developed by ***Roger Cray in 1976***.



## 54 EXAMPLE OF SUPER COMPUTER

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## 55 ON THE BASIS OF SIZE

- Mainframe computer
  - They are comparatively smaller than the supercomputers.
  - It performs a simultaneous execution of millions of instructions together, and yet, it offers a slower speed than the supercomputers. Still, these are pretty fast.
  - It is used to store large amount of databases in them .
  - Normally they are used in banks, educational institutions, insurance companies, government agencies, insurance companies etc. to store data about customers, student, citizens and general policy holders.
  - Examples:- UNIVAC I, IBM 1401, ICL 2959 etc.

## 56 EXAMPLES OF MAINFRAME COMPUTERS

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## 57 ON THE BASIS OF SIZE

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- Mini computer
  - These computers are medium in size. It is bigger than micro and smaller than mainframe computer. In terms of size and processing speed they lie between mainframe computer and micro computer. They are also called a mid-range computers and workstations.
  - They are used by small business and firms. Individuals departments of large company or organization used mini computer for specific purpose.

## 58 ON THE BASIS OF SIZE

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- Mini computer
  - Minicomputers were used for scientific and engineering computations, business transaction processing, file handling, and database management.
  - Examples:- IBM AS, Prime series, HP 9000, IBM 8000 series.



## 59 ON THE BASIS OF SIZE

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- Micro computer
  - It is the smallest computers of all.
  - A micro computer is a computer with a microprocessor as its CPU.
  - They are extensively used in home and offices. They are cheap, compact and can be easily accommodated of a study table. Now-a-days, mostly used computers are microcomputers.
  - They are single user computers and supports many higher level languages, multimedia, graphics, 3D graphics and games. Internet is popular because of the availability of PCs for all income groups.
  - Example:- Desktop, Laptop, smart phones and Personal Digital Assistant (PDA).



## 60 ASSIGNMENT

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- Write short notes on:
  - Laptop
  - Desktop
  - Smart Phones
  - PDA

## 6 | ON THE BASIS OF PURPOSE

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- General Purpose Computer
  - Those computers that are used in different fields for different purpose are called general purpose computer.
  - The computers that we see today are general purpose computer.
  - They are used for word processing, multimedia application, publication etc.

## 62 ON THE BASIS OF PURPOSE

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- Specific Purpose Computer
  - Those computers that are used to solve particular or specific problem are called specific purpose computer.
  - They are generally used in airlines, reservation, bank check processing system, military, traffic control system, weather forecasting etc.

## 63 ON THE BASIS OF BRAND

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- IBM PC
  - IBM (International Business Machine) is the largest computer manufacturing company establishing in 1924 in U.S.A.
  - The computers manufactured by IBM is IBM computer. In the beginning IBM manufactured mainframe computers followed by mini and macro computer. It produces both hardware and software of computer system.
  - So the personal computers developed by IBM itself is called IBM PC. These are the original or branded computers.

## 64 ON THE BASIS OF BRAND

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- IBM PC

- These computers are reliable, durable and have better quality but costlier than IBM Compatible computer.
- Since the early 1950s, IBM has produced mainframe and mid-ranged computers. They still do today. However, they are not in the personal computers market anymore. They stopped producing personal computers in 2005, some organizations and individuals may still be using IBM-branded PCs and laptops. However, it is important to note that the IBM PC brand has been sold and resold several times over the years, with Lenovo being the current owner of the brand.



## 65 ON THE BASIS OF BRAND

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- IBM Compatibles:
  - Computers that have some functional characteristics and principles of IBM computers are called IBM compatibles. All the computers that are manufactured by another companies rather than IBM company are known as IBM compatibles. It can perform all the tasks that an IBM PC computer does.
  - Basic architecture is similar to IBM PC excepting few technologies. All the software and programs which run in IBM computers can equally run in IBM compatibles. These are cheaper and their parts are also easily available in the market.
  - They are less reliable, less durable, have low quality and cheaper than IBM PC.

## 66 ON THE BASIS OF BRAND

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- Apple/ Macintosh
  - Computers that are manufactured by apple cooperation, a leading computers manufacturing computers of USA in 1970 are known as apple/ Macintosh computers.
  - These computers use their own software and hardware. These are totally different than IBM computers, in terms of both hardware and software. So software developed by apple can't run on IBM computers and vice versa.

## 67 ON THE BASIS OF MODEL

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- XT (Extended technology) computer
  - They cannot support GUI based operating system, their processing speed is 4.77 MHz and Intel 8080, 8086, 8088 series of microprocessors is used.
  - They are comparatively less flexible and slower than other models.

## 68 ON THE BASIS OF MODEL

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- AT computer (Advanced Technology) computer
  - They support GUI based operating systems. Its speed is 2 GHz and word length 64 bits. Their processors are intel series of 80286, 80386, Pentium II etc.



## 69 ON THE BASIS OF MODEL

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- PS/2 computers
  - They are laptop computer which is rechargeable and battery based system. They were operated with OS/2 operating system in the beginning but these days they are operated with windows operating system.
  - They are faster and efficient than AT models.

## DATA AND PROGRAM REPRESENTATION IN COMPUTER

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- Data and instructions cannot be entered and processed directly into computers using human language. Any type of data be it numbers, letters, special symbols, sound or pictures must first be converted into machine-readable form i.e. binary form. All forms of data can be represented in binary system format.
- Computers not only process numbers, letters and special symbols but also complex types of data such as sound and pictures. However, these complex types of data take a lot of memory and processor time when coded in binary form. This limitation necessitates the need to develop better ways of handling long streams of binary digits. Higher number systems are used in computing to reduce these streams of binary digits into manageable form. This helps to improve the processing speed and optimize memory usage.



# NUMBER SYSTEMS AND THEIR REPRESENTATION

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- **A number system** is the system of naming or representing numbers. It is the mathematical notations for representing numbers of a given set by using digits or other symbols.
- As far as computers are concerned, number systems are classified into two major categories.
  - Positional Number System
  - Non- Positional Number System

## POSITIONAL NUMBER SYSTEMS

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- In positional number system, each symbol represents different value depending on the position they occupy in a number and each system has a value that relates to the number directly next to it.
- Eg. 12345 and 54321 are different.
- The four positional number systems are:-





## POSITIONAL NUMBER SYSTEMS

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- The four positional number systems are:-

System	Base	Symbols	Examples
Decimal	10	0,1,2,3,4,5,6,7,8,9	4355.6
Binary	2	0,1	$(1101.11)_2$
Octal	8	0,1,2,3,4,5,6,7	$(145.23)_8$
Hexadecimal	16	0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F	$(A2C.A1)_{16}$

## NON-POSITIONAL NUMBER SYSTEMS

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- In non-positional number system, each symbol represents a value regardless of the position it's in the number.
- Here each symbol has their own value.
- Eg: value of 'V' is same in both 'VII' and 'IV'
- The values of each symbols are:-

Symbol	I	V	X	L	C	D	M
Value	1	5	10	50	100	500	1000

## 75 DECIMAL NUMBER SYSTEM

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- In this number system, the digits 0 to 9 represent numbers. As it uses digits to represent a number. It is also called the base 10 number system. This number system is also called denary. Each digit has a value based on its position called place value.
- It is represented by a subscript 10 or D.
- They are used in our daily lives for calculations.
- Eg.  $(101)_{10}$ ,  $(8927)_{10}$  etc.

## 76 BINARY NUMBER SYSTEM

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- A number system that uses two digits (binary 0 and 1) to represent numbers is called a binary number system or base 2 number system. Information handled by a computer must be encoded in a suitable format.
- The ON and OFF states of switch that a computer can understand are represented by 1 and 0.
- They are represented by subscript 2 or B.
- Eg:-  $(101101)_2$



## 77 OCTAL NUMBER SYSTEM

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- Octal means 8 which came from the Latin word “octo”. It is base 8 number system consisting of eight digits. 0, 1, 2, 3, 4, 5, 6 and 7.
- Octal numbers are used in programming as a compact means of representing binary numbers. They are represented by script 8 or 0.
- Eg:  $(157)_8$  ,  $(1010)_8$  etc.

## 78 HEXADECIMAL NUMBER SYSTEM

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- Hexadecimal number system is the base 16 number system. It used 16 symbols to represent numbers. The 16 symbols used are 0,1,2,3,4,5,6,7,8,9,A, B,C,D,E, and F. They are represented by subscript 16 or H.
- A=10, B=11, C=12, D=13, E=14, and F=15.
- Eg:  $(BBA)_{16}$  ,  $(109EF)_{16}$  etc.
- Hexadecimal numbers are used by programmers to describe locations in memory because it can represent every bytes (i.e eight bits) as two consecutive hexadecimal digits, which would have required eight digits in binary numbers and 3 digits in decimal numbers.
- It is also used to describe colors in web page. Eg:- #FF0000 for red and #FFFFFF for white.