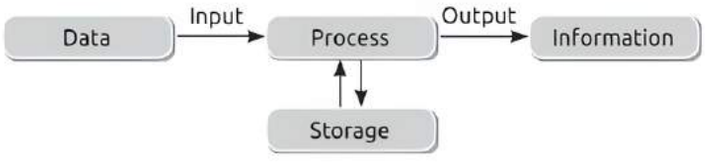
Components of Computer System

Fastrack REVISION

- **Computer System:** Computer is an electronic device which is capable of receiving information or data and perform a series of operations in accordance with a set of operations. This produces results in the form of data or information. Computer is a machine capable of solving problems and manipulating data.

  It accepts and processes the data by doing some mathematical and logical operations and gives us the desired output. Therefore, we may define a computer as an electronic device that transforms data into information.
- **Computer System Functioning:** At a fundamental level, computers operate through these four functions: input, output, processing, and storage.
  - **Input:** The transfer of information into the system (e.g., through a keyboard).
  - **Output:** The presentation of information to the user (e.g., on a screen).
  - **Processing:** The retrieval or manipulation of information into a new form (e.g., results from a search engine).
  - **Storage:** The storing or preservation of information for later use (e.g., files stored on a hard drive).

Input-Process-Output Cycle

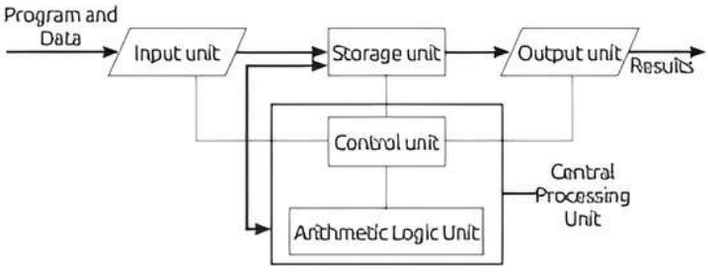


- A computer system is a collection of different hardware and software components put up together to perform

these three major functions again and again, *i.e.*, input, process and output. Computer systems are used in every walk of life to assist us in the various tasks we perform. A computer system allows us to store, process, display and communicate information.

- The full form of 'Computer' is 'Common operating machine particularly used for technological engineering research'. The word computer has been derived from the word compute, which means to calculate.
- **Characteristics of a Computer System**
  - **Accuracy:** A computer system always generates accurate results if provided with valid data and instructions. A computer system never makes mistakes.
  - **Speed:** Computer is a very fast device and can carry out instructions at a very high speed without making mistakes.
  - **Versatility:** Versatility is one of the most important and amasing quality of a computer. A computer is a versatile device which means it can perform a variety of tasks depending upon the instructions given to it.
  - **Reliability:** Computers can work for long hours without getting tired and without committing any mistake. That is why computers are considered more reliable than humans.
  - **Diligence:** It does not lose concentration even after working continuously for a long duration.
  - **Vast Storage Capacity:** Computers never forget anything as they have a huge storage capacity to save data and instructions. A computer can store and recall any amount of information, at any time.
- **Limitations of a Computer System**
  - **Lack of Common-sense:** There is no common sense in computers and this is one of the major limitations of computers. They cannot make sound and prudent decisions based on a simple perception of the situation or facts.
  - **No IQ:** Computers lack Intelligence Quotient (IQ); they typically have zero IQ. In simple words, computers cannot see or think of any specific action as per the corresponding situation.
  - **No Feelings:** The computer is still a machine and therefore, has no feelings. Unlike humans, computers do not feel anything. They lack emotion.
  - **No Thinking Capability:** Computers cannot think of themselves, which restricts them to do any task on their own. They are machines in which instructions are stored or programmed to perform specific tasks.
  - **No Decision-making Ability:** Computers are incapable of making decisions because they do not contain the necessary elements. Decision-making is a complex process that usually requires elements such as information, intelligence, knowledge, wisdom, and judgment capability.
  - **No Learning Power:** Computers do not have the power to learn, and therefore, they cannot learn things on their own.
- **Areas of Applications of Computers**
  - **Business:** Computer is used in business organisations for doing various tasks such as payroll calculations, budgeting, sales analysis, financial forecasting, etc.
  - **Banking:** In the banking sector, computers are used to store details of customers and conduct transactions, such as withdrawal and deposit of money through ATMs. Banks have reduced manual errors and expenses to a great extent through extensive use of computers.
  - **Education:** Computers are used in education sector through online classes, online examinations, referring e-books, online tutoring, etc. They help in increased use of audio-visual aids in the education field.
  - **Healthcare and Medicine:** Computers are used in hospitals to maintain a database of patients' history, diagnosis, X-rays, live monitoring of patients, etc. Surgeons now-a-days use robotic surgical devices to perform delicate operations, and conduct surgeries remotely.
  - **Military:** Computers are also used for defence purposes as they play an important role in the design and development of weapons, other equipment's and machineries which are used for communication in distant and remote areas.
  - **Scientific Research:** Computer systems are used by scientists to perform tasks such as developing hypothesis, data interpretation, exchange data electronically, and simulate complex events because of characteristics such as high speed and accuracy.
  - **Engineering:** Computer Aided Engineering (CAE) software even allows designers to specify the type of material to be used for different parts of a product.
  - **Manufacturing:** Automobile units use robots for doing tasks such as painting, welding, blending metal, etc. Manufacturing using computers and Robotics is known as Computer Aided Manufacturing (CAM).
- **Design of a Computer System:** The major functional units of a computer are listed below.

1. Input unit
2. Output unit
3. Processing unit
4. Memory and storage unit

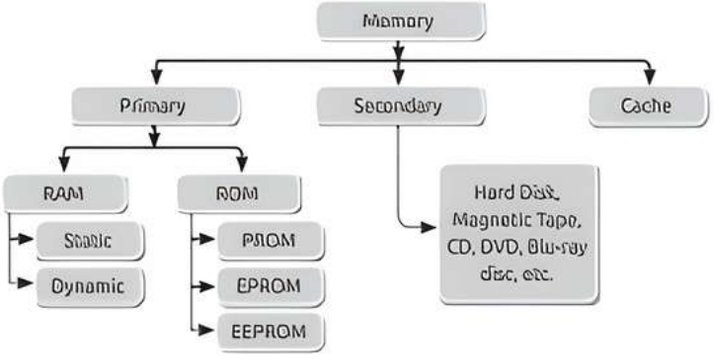


Here, dotted lines (.....) indicate flow of instructions and solid lines (_____) indicate the flow of data.

- **Input Unit:** An Input unit comprises the components that are used to accept the input from a user. Different input devices, such as a mouse, keyboard, microphone, etc., collectively make up this unit. These devices are also known as the input devices.
- **Output Unit:** An output unit comprises the components that are used to display/give output to the user. Different output devices, such as projector, printer, speaker, etc., collectively make up this unit.
- **Processing Unit:** A processing unit of a computer system is the CPU or the Central Processing Unit. CPU is also known as the brain of a computer as it controls the overall functioning of a computer system by sending control instructions/signals to all other units of the computer system. CPU is made up of two parts: Arithmetic Logic Unit (ALU) and Control Unit (CU).
  - **Arithmetic Logic Unit (ALU):** ALU carries out all the numerical calculations and logical comparisons as per the instructions given.
  - **Control Unit (CU):** CU controls all the operations like input, processing and output of a computer system by sending signals to different components of the computer system.

- **Memory Unit:** Memory unit is a component of a computer system. It is used to store data, instructions and information. It is actually a work area of computer, where the CPU stores the data and instruction.

  The computer memory is mainly of three types:
  - Primary memory/Main memory
  - Secondary memory
  - Cache memory



- **Primary Memory:** Primary memory, also known as Main memory, is further divided into two subcategories—RAM and ROM.
  - **Random Access Memory (RAM):** Random Access Memory or RAM is also known as temporary memory. RAM is a read/write memory which stores data until the computer system is on. All the data and instructions will be erased from RAM as soon as the power of a computer system is turned off. That is why, it is also known as volatile memory as it is dependent on power and cannot hold data when the power is turned off. RAM is further divided into the following types.
    - **Static RAM (SRAM):** Static RAM continues to hold the data and instructions consistently till the power is supplied. There is no need to refresh this memory like DRAM. SRAM consumes more power and is expensive too. But it is also the fastest memory and has a long life.
    - **Dynamic RAM (DRAM):** DRAM, unlike SRAM, needs to be refreshed continuously in order to retain the data and instructions. DRAM is slower and smaller in size as compared to SRAM and also has a short data life. It consumes less power and is less expensive as compared to SRAM.
  - **Read Only Memory (ROM):** Read-Only Memory or ROM is also known as permanent memory as it holds the data and instructions even if there is no power supplied to it. It is a non-volatile memory as it retains the programs even if the power is turned off. ROM is further divided into the following types.
    - **Programmable Read-Only Memory (PROM):** PROM is a read-only memory that can be programmed only once. Information once stored in PROM cannot be edited or modified later.
    - **Erasable and Programmable Read-Only Memory (EPROM):** EPROM is the editable ROM. It means that the data stored in EPROM can be erased and rewritten. Data stored in EPROM can be erased by exposing it to the ultraviolet light.
    - **Electrically Erasable and Programmable Read-Only Memory (EEPROM):** EEPROM is also an editable ROM, but the only difference between EPROM and EEPROM is that EEPROM is programmed and erased electrically.

- **Secondary Memory:** Secondary memory is also known as External Memory or Auxiliary Memory. It is also permanent and non-volatile in nature. It holds the instructions permanently even when the power is turned off. Secondary memory or Secondary storage devices are of two types - magnetic and optical. Magnetic devices include the hard disks and optical storage devices include the CD, DVD, Blu-ray disc, pen drive, etc.
- **Cache Memory:** Cache memory is a very high speed memory which can increase the processing speed of the CPU to a great extent. It acts as a buffer between the CPU and the main memory. Cache memory holds those instructions that are most frequently used by the CPU.
- **Units for Measuring Computer Memory:**

Name of Unit	Abbreviation	Storage Capacity
Bit	Bit	A single binary digit either 0 or 1
Nibble	Nibble	A combination of 4 bits

Byte	Byte or B	A combination of 8 bits
Kilobyte	KB	1024 bytes
Megabyte	MB	1024 kilobytes
Gigabyte	GB	1024 megabytes
Terabyte	TB	1024 gigabytes
Petabyte	PB	1024 terabytes
Exabyte	EB	1024 petabytes
Zettabyte	ZB	1024 exabytes
Yottabyte	YB	1024 zettabytes
Brontobyte	BB	1024 yottabytes
Geopbyte	Geopbyte	1024 brontobytes

- **Communication Technology:** Communication technology has created an informed society. Electronic communication devices, such as computers and mobile phones have made information more accessible than ever. Communication technology can be found in classrooms, work environments and homes. Some of the popular value-added services of communication technology, are as follows.
  - **E-mail:** Electronic mail is the exchange of computer-stored messages by telecommunication. It is a method of exchanging digital messages between one or more recipients.
  - **E-business:** It is the administration of conducting business via the Internet. It derived from terms such as 'e-mail' and 'e-commerce' which is the conduct of business on the Internet.
  - **E-banking:** It is an abbreviation for electronic banking. It allows you to conduct bank transactions online, instead of finding a bank and interacting with a teller.
  - **E-learning:** It is the term used to explain the scenario where teaching-learning process takes place online using the Internet and communication technology.
  - **E-shopping:** It refers to the process of searching for, and purchasing goods and services over the Internet, through the use of a web browser.
  - **Multimedia Message Service (MMS):** This is an evolution from the highly successful Short Messaging Service (SMS) product.
  - **E-reservation:** E-reservation or E-booking means making a reservation or appointment for a travel service via the Internet.
  - **E-group:** It is a term that refers to an online group of people that interact with each other. It allows members of the group to create, post, comment to and read the posts sent in the group.
  - **E-governance:** It is the use of Information and Communications Technology (ICT) for the following activities.
    - Promote a more efficient and cost-effective government
    - Facilitate more convenient government services
    - Allow greater public access to information
    - Make government more accountable to citizens

Practice Exercise

Multiple Choice Questions

Q 1. Which of the following is not an example of an input device?
a. Mouse b. Keyboard
c. Printer d. Track ball

Q 2. What are raw facts and figures called?
a. Information b. Output
c. Data d. None of these

Q 3. Which of the following is one of the characteristics of a computer?
a. No IQ
b. Inability to think on its own
c. Speed
d. None of the above

Q 4. What does the term CAE stand for?
a. Computer Aided Engine
b. Computer Assisted Engineering
c. Computer Aided Engineering
d. Computer According Engineering

Q 5. Which of the following is also known as a microprocessor?
a. CPU b. MU
c. CU d. ALU

Q 6. Which of the following is the full form of ALU?
a. Arithmetic Logic Unit
b. Arithmetical Logical Unit
c. Arithmetical Logic Unit
d. None of the above

Q 7. Which unit controls all the parts of a computer system?
a. ALU b. CU
c. CPU d. MU

Q 8. Which unit of the computer system is responsible for holding the input data, intermediate results, output results and program and makes them available for processing as and when required?
a. Input Unit b. Internal Storage Unit
c. Arithmetic Logic Unit d. Control Unit

Q 9. Which among the following is not the characteristic of the computer?
a. Diligence b. Unlimited Memory
c. Versatile d. Accuracy

Q 10. The contents of main memory, currently in use and likely to be needed in future is stored in which memory?

a. Registers b. Hard Disk
c. Flash Memory d. Cache Memory

Q 11. Name the type of memory that is used in pen drive.

a. Magnetic Disk Memory
b. Optical Disk Memory
c. Flash Memory
d. None of the above

Q 12. Which of the following is an example of a volatile memory?

a. RAM b. Hard disk
c. ROM d. All of these

Q 13. What are RAM and ROM collectively known as?

a. Primary Memory b. Tertiary Memory
c. Secondary Memory d. External Memory

Q 14. How many types of ROM are there?

a. 3 b. 2
c. 4 d. 5

Q 15. Which of the following is not a type of memory?

a. RAM b. FPROM
c. EEPROM d. ROM

Fill in the Blanks

Type Questions

Q 16. Computers have become an ..... part of our lives.

Q 17. A computer system always generates..... results.

Q 18. Computers can process ..... of instructions per second.

Q 19. ..... is one of the most important and amazing qualities of a computer.

Q 20. A computer does not lose ..... even after working continuously for a long time.

Q 21. Computers are ..... of decision-making.

Assertion and Reason

Type Questions

Directions (Q. Nos. 22-26): *In the questions given below, there are two statements marked as Assertion (A) and Reason (R). Read the statements and choose the correct option.*

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true, but Reason (R) is not correct explanation of Assertion (A).
c. Assertion (A) is true, but Reason (R) is false.
d. Assertion (A) is false, but Reason (R) is true.

Q 22. **Assertion (A):** The full form of 'Computer' is 'Common operating machine particularly used for technological engineering research'. The word computer has been derived from the word compute which means to calculate.

Reason (R): A computer system is a collection of different hardware and software components put up together to perform these three major functions again and again, *i.e.*, input, process and output.

Q 23. **Assertion (A):** A computer can store and recall any amount of information, at any time.

Reason (R): Computers never forget anything as they have a huge storage capacity to save data and instructions.

Q 24. **Assertion (A):** Computers are incapable of making decisions because they do not contain the necessary elements. Decision-making is a complex process that usually requires elements such as information, intelligence, knowledge, wisdom, and judgment capability.

Reason (R): Computers cannot work for long hours without getting tired and without committing any mistake. That is why computers are not considered more reliable than humans.

Q 25. **Assertion (A):** CPU is also known as the brain of a computer.

Reason (R): Controls the overall functioning of a computer system by sending control instructions/ signals to all other units of the computer system.

Q 26. **Assertion (A):** Computer Aided Engineering (CAE) software does not allows designers to specify the type of material to be used for different parts of a product.

Reason (R): Computer systems are used by scientists to perform tasks such as developing hypothesis, data interpretation, exchange data electronically, and simulate complex events because of characteristics such as high speed and accuracy.

Answers

1. (c)	2. (c)	3. (c)	4. (c)	5. (a)
6. (a)	7. (b)	8. (b)	9. (b)	10. (d)
11. (c)	12. (a)	13. (a)	14. (a)	15. (c)

16. integral 17. accurate
18. millions 19. Versatility
20. concentration 21. incapable

22. (b)	23. (a)	24. (c)	25. (a)	26. (d)

Case Study Based

Questions

Case Study 1

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored. The memory is divided into large number of small parts called cells. Each location or cell has a unique address, which varies from zero to memory size minus one.

Q 1. Which of the following memory is non-volatile?

a. RAM b. ROM
c. Cache d. ROM and Cache

Q 2. Which memory acts as a buffer between CPU and main memory?

a. RAM b. ROM
c. Cache d. Storage

Q 3. Which of the following is the lowest in the computer memory hierarchy?

a. Cache b. RAM
c. Secondary memory d. CPU registers

Q 4. Which of the following has the fastest speed in the computer memory hierarchy?

a. Cache b. Register in CPU
c. Main memory d. Disk cache

Answers

1. (b) 2. (c) 3. (c) 4. (b)

Case Study 2

A computer system is a collection of different hardware and software components put up together to perform these three major functions again and again, *i.e.,* input, process and output. Computer systems are used in every walk of life to assist us in the various tasks we perform. A computer system allows us to store, process, display and communicate information. The full form of 'Computer' is 'Common operating machine particularly used for technological engineering research'. The word computer has been derived from the word compute which means to calculate.

Q 1. What do you mean by the term system?
Q 2. Define the term information.
Q 3. What is the use of output unit?
Q 4. What do you mean by the term versatility?

Answers

1. The term system refers to a group of interconnected components which work together to perform an integrated whole.
2. Data are raw facts which when processed gives us information.
3. The output Unit is responsible for recording the final results sent from internal storage unit.
4. Versatility is one of the most important and amazing qualities of a computer.

? Very Short Answer Type Questions

Q 1. How can you describe a computer?

Ans. A computer can be described as an electronic device that processes raw data as input from a user, and gives meaningful information as output, back to the user.

Q 2. What is the full form of 'Computer'?

Ans. The full form of Computer is: Common operating machine particularly used for technological engineering research.

Q 3. What is a computer system?

Ans. Computer systems refers to a computer along with any software and peripheral devices that are necessary to make the computer perform a particular task.

Q 4. What are the different types of memories that form the Memory Unit of the Computer System?

Ans. RAM, ROM, Registers, Cache, Hard Disk, Memory Card, Pen drive, optical disk, etc.

Q 5. What is the difference between CD and DVD?

Ans. DVDs offer more data storage capacity compared to CDs. CDs are also commonly used for audio Computer and program files, while DVDs are used for video and program files.

Q 6. How are the terms Data and Information related?

Ans. Data are simply facts or figures — bits of information, but not information itself. When data are processed, interpreted, organised, structured or presented so as to make them meaningful or useful, they are called information.

Q 7. What is an Input Device? Name two input devices.

Ans. Input devices are peripherals that are used to provide data to the computer system.
For example- Keyboard, Mouse, Scanner, etc.

Q 8. For what purpose were computers used initially?

Ans. Initially, computers were used for performing complex calculations.

Q 9. What do you mean by 'output'?

Ans. Output is the final result/information after processing the raw data. Output is given by the computer to the user after completing the processing stage.

Q 10. Which part of CPU sends signals to all parts of a computer system?

Ans. Control unit

Q 11. Describe the memory hierarchies of a computer system.

Ans. The different types of memories that forms the memory unit of the computer system are:
(i) CPU Registers
(ii) Cache Memory
(iii) Main Memory
(iv) Secondary Memory

Q 12. What are the two types of secondary memory?

Ans. Secondary memory is of two types—magnetic and optical.

Q 13. What is a bootstrap loader?

Ans. The bootstrap loader is a program that holds the instructions to load the operating system from the hard disk to the RAM.

Short Answer Type Questions

Q 1. How is the speed of computer expressed?

Ans. The speed of a computer is either expressed in megahertz (MHz) or gigahertz (GHz). Mega means million and hertz means instructions per second. Therefore, 500 MHz is 500 million instructions per second and 500 GHz is 500 billion instructions per second.

Q 2. Discuss any two limitations of a computer system.

Ans. The two limitations of a computer system are as follows:

(i) **Inability to Take a Decision:** Computers are incapable of decision-making as they do not possess the essential skills necessary to take a decision, i.e., wisdom, intelligence and the ability to judge.

(ii) **Inability to Express Ideas:** Since it is a machine, it will only follow the instructions and cannot give views or express ideas.

Q 3. What is the function of an ALU?

Ans. The Arithmetic Unit is responsible for performing arithmetic operations like addition, subtraction, multiplication and division. The logical unit is used to perform logic operations such as comparing, selecting, matching and merging of data.

Q 4. Explain input unit and output unit in detail.

Ans. **Input Unit:** An input unit comprises the components that are used to accept input from a user. Different input devices, such as mouse, keyboard, scanner, microphone, etc., collectively make up this unit. These devices are also known as the input devices.

Output Unit: An output unit comprises the components that are used to display/give output to the user. Different output devices, such as monitor, printer, projector, speaker, etc., collectively make up this unit.

Q 5. How is SRAM different form DRAM?

Ans. **Static RAM (SRAM):** Static RAM continues to hold the data and instructions consistently till the power is supplied. There is no need to refresh this memory like DRAM. SRAM consumes more power and is expensive too. But, it is also the fastest memory and has a long life.

Dynamic RAM (DRAM): DRAM, unlike SRAM, needs to be refreshed continuously in order to retain the data and instructions. DRAM is slower and smaller in size as compared to SRAM and also has a short data life. It consumes less power and is less expensive as compared to SRAM.

Q 6. Define Cache memory.

Ans. Cache memory is a very high speed memory which can increase the processing speed of CPU to a great extent. It acts as a buffer between the CPU and the main memory. Cache memory holds those instructions that are most frequently used by the CPU. The instructions are transferred from the disk to cache memory by the operating system, from where the CPU can access them quickly.

Q 7. State two differences between a RAM and a ROM.

Ans. **Difference between RAM and ROM**

RAM (Random Access Memory)	ROM (Read Only Memory)
RAM is easily accessed by the processor.	ROM can't be directly accessed by the processor because first it is transferred into RAM where it is executed by the processor.
RAM is volatile in nature as it automatically erased when computer shutdowns.	ROM is non-volatile in nature as it never erased when there is any shutdown or restart of computer.

CHAPTER TEST

Multiple Choice Questions

Q 1. Computers invariably use RAM for .....

a. High complexity
b. High resolution
c. High speed main memory
d. High flexibility

Q 2. How many types of RAMs are?

a. 2 b. 3
c. 4 d. 5

Q 3. Which one of the following is volatile in nature?

a. ROM b. EROM
c. PROM d. RAM

Q 4. In which type of ROM, data can be erased by ultraviolet light and then reprogrammed by the user or manufacturer?

a. PROM b. EPROM
c. EEPROM d. Both a. and b.

Fill in the Blanks

Q 5. ATMs are an example of using computers in ..... industry.

Q 6. ..... is the final result/information after processing the raw data.

Q 7. ..... comprises raw facts and figures.

Assertion-Reason Type Questions

Directions (Q. Nos. 8-9): *In the questions given below, there are two statements marked as Assertion (A) and Reason (R). Read the statements and choose the correct option.*

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true, but Reason (R) is not correct explanation of Assertion (A).
c. Assertion (A) is true, but Reason (R) is false.
d. Assertion (A) is false, but Reason (R) is true.

Q 8. Assertion (A): E-Banking refers to the process of searching for, and purchasing goods and services over the Internet, through the use of a web browser.
Reason (R): Electronic communication devices, such as computers and mobile phones have made information more accessible than ever.

Q 9. Assertion (A): E-group refers to an online group of people that interact with each other. It allows members of the group to create, post, comment to and read the posts sent in the group.
Reason (R): Cache memory is a very slow memory which can decrease the processing speed of the CPU to a great extent.

Case Study Based Questions

Q 10. Computer is an electronic device which is capable of receiving information or data and perform a series of operations in accordance with a set of operations. This produces results in the form of data or information. Computer is a machine capable of solving problems and manipulating data. It accepts and processes the data by doing some mathematical and logical operations and gives us the desired output.
Therefore, we may define a computer as an electronic device that transforms data into information. Data can be anything like marks obtained by you in various subjects, it can also be name, age, sex, weight, height, etc. of all the students in your class or income, savings, investments, etc. of a country.

(i) Primary storage is ..... as compared to secondary storage.
a. Slow and inexpensive
b. Fast and inexpensive
c. Fast and expensive
d. Slow and expensive

(ii) Storage that stores or retains data/information permanently after power off is called:
a. Volatile storage
b. Non-volatile storage
c. Sequential storage
d. Both a. and b.

(iii) Which of the following is/are examples of non-volatile storage?
a. Magnetic disks
b. USB flash drive and Memory card
c. Hard Drive
d. All of the above

(iv) The process of dividing the disk into tracks and sectors is called:
a. tracking b. crashing
c. dicing d. formatting

Q 11. Computer is an advanced electronic device that takes raw data as input from the user and processes it under the control of set of instructions (called program), gives the result (output), and saves it for the future use. A computer system is made up of both hardware and software. Software is another term for computer program. Software controls the computer and makes it do useful work. Without software a computer is useless. Hardware refers to the physical components that make up a computer system. These include the computer's processor, memory, monitor, keyboard, mouse, disk drive, printer and so on.

(i) What are supercomputers?
(ii) What are microcomputers?
(iii) What do you mean by minicomputers?
(iv) What are mainframe computers?

Very Short Answer Type Questions

Q 12. What is 'block' in a hard disk?
Q 13. Name the type of memory that is placed is logically positioned between the Registers and Main Memory.
Q 14. Give some examples of output devices.

Short Answer Type Questions

Q 15. How are computer systems helpful to persons employed in printing and publishing media industry?
Q 16. What is Flash Memory used for?