

INSIDE SYSTEM UNIT

CHAPTER

4

After completing this lesson, you will be able to:

- Differentiate between CPU and system unit.
- Identify computer casing and its types.
- Define power supply and describe the components found on motherboard (BIOS, ports, expansion slot, type of cables, memory slot, disk controller, cooling system and buses).
- Describe the ports (serial, parallel, PS/2, USB and fire wire ports).
- Identify sound, video, modem and network cards.
- Describe DRAM, ROM, SRAM and PROM.

UNIT INTRODUCTION

This unit presents information about the components of computer that exists inside the system unit. It describes the purpose of expansion cards that are installed on expansion slots on the motherboard or integrated on it. It also explains memory chips, cables used inside the system unit and ports that are found at the back of the system unit for connecting input/output devices.

4.1 COMPUTER CASING AND SYSTEM UNIT

Q.1 What is computer casing? State its purpose.

Answer

Computer casing is a box or an enclosure that contains most of the components of computer system.

Use of computer casing

It protects and organizes all the components that make up a computer. Without casing, each of the components within the computer would be vulnerable to dirty foreign objects and electrical interference. Casing also reduces the overall noise produced by computer fan and drives.

4.1.1 CPU AND SYSTEM UNIT

Q.2 Define system unit.

Answer

System Unit

Computer casing with all the components installed inside it is called system unit or main unit of the computer system. Usually, people incorrectly use the word CPU for system unit.

Q.3 Differentiate between microprocessor and system unit.

Answer

Microprocessor and System Unit

Microprocessor is the CPU of the computer that is installed on the motherboard whereas, system unit contains motherboard, hard disk, DVD writer, RAM etc.

System unit and microprocessor are shown in Fig 4.1



Fig.4.1 System Unit (left) and Microprocessor (right)

4.1.2 COMPUTER CASINGS

Q.4 Define computer casing. Explain its types.

Answer

Computer Casing

Computer casing is a box or enclosure that contains most of the components of computer system.

Types of Computer Casings

Computer casings are of two types:

- Tower Casing
- Desktop Casing



Fig. 4.2 Tower (left) and Desktop (right) computer casings

1. Tower Casing

Tower casing is the most commonly used one.

2. Desktop Casing

Desktop casing is designed to keep on the desk and usually monitor is kept over it.

4.1.3 EXPLORING THE SYSTEM UNIT

Q.5 Describe the components of system unit.

Answer

Components of System Unit

System unit contains the following two main components:

- Power supply
- Motherboard

1. Power Supply

The purpose of power supply in a computer is to convert alternating current (AC) to low-voltage direct current (DC) for operation of components of the computer. A power supply is already fixed in the casing when it is purchased. A power supply is shown in Fig. 4.3.



Fig. 4.3 Power Supply

2. Motherboard

Motherboard is also known as main board or system board. A motherboard is shown in Fig. 4.4.

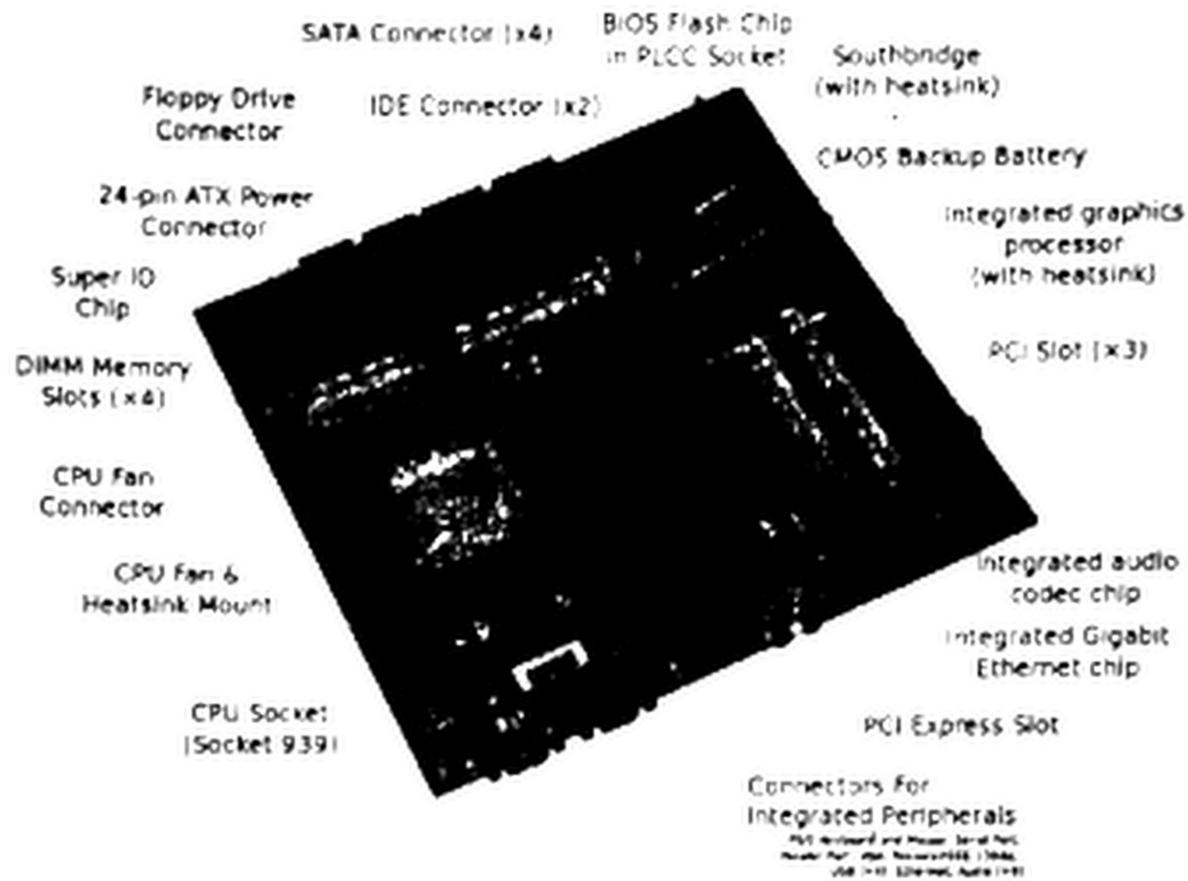


Fig 4.4 Motherboard

Motherboard is a circuit board that connects all the components of the computer system through ports, cables or expansion slots.

Q.6 Name some important components of a motherboard. Explain each component in detail.

Answer

Some Important Components/Parts of Motherboard

The following are some important components or parts of a motherboard:

- CPU Socket
- BIOS
- Ports
- Expansion slots
- Ribbon cable
- Memory slots
- Disk controller
- Cooling system
- Buses

1. CPU Socket

CPU Socket is used to mount the CPU or Processor on the motherboard. The CPU socket is the connector on the motherboard that houses a CPU and forms the electrical interface and contact with the CPU.

2. BIOS

BIOS stands for Basic Input Output System. It is a non-volatile ROM chip. The manufacturer permanently stores system programs in a firmware.

Purpose of BIOS

BIOS programs have two purposes:

- i. When the computer is turned on, it initializes the computer devices such as keyboard, mouse, Hard disk, etc., and then loads the operating system from the hard disk into the RAM and makes the computer ready for operation.

- ii. Secondly, it controls the basic input/output operations of all the peripheral devices attached to the computer. BIOS also has a Setup utility that allows us to configure the computer hardware, select boot device, set password, set the clock and enable or disable computer components.

3. Ports

A port is an interface at the back of the computer to connect external devices. There are various types of ports on the motherboard, which are used for connecting input/output devices.

4. Expansion slot

An expansion slot is a long socket on the motherboard on which circuit boards (expansion cards) are inserted to add new capabilities to the computer. There are different types of expansion slots on the motherboard in which various types of cards are fixed. These include video display, sound, modem and network cards. In modern computers, the circuitry of many of these cards is integrated in the motherboard itself to reduce size and cost.

Types of Expansion slot

Expansion slot standards include:

- AGP
- PCI
- PCI express

Expansion slots are shown in Fig 4.5

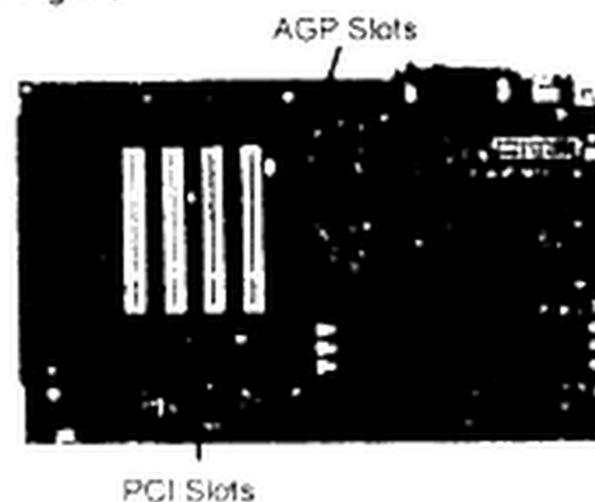


Fig 4.5 Expansion slots on motherboard

i. AGP

AGP stands for Accelerated Graphics Port. It provides a high-speed channel for attaching video card to a motherboard. It provided a dedicated pathway between the processor and the graphics card. Its bus width is 32 bits.

ii. PCI

PCI is used to attach different expansion cards to the computer. It is still used in some computers but is superseded by PCI Express.

iii. PCI Express

PCI Express was designed to replace PCI and AGP standards. PCI Express has a bus width of 32 bits. It is the latest standard expansion slot in microcomputers and laptop computers. The main advantage of PCI Express is that it provides high-speed serial communication.

5. Ribbon Cable

Ribbon Cable has several parallel wires in the same flat plane that looks like a piece of ribbon which is why it is called ribbon cable. It was used in the past for transmitting information between motherboard and devices such as floppy drive, hard disk and CD-ROM drive.

Types of Ribbon Cable

Following are the different types of ribbon cable interfaces:

- IDE Interface Cable
- SATA Interface Cable

i. IDE Interface Cable

Western Digital developed integrated Drive Electronics (IDE) interface for attaching hard drivers to motherboard. The first hard drive that used IDE interface appeared in Compaq PCs in 1986.

Hard drives that had IDE interface had drive controller integrated into the drive itself rather than having a separate controller on the motherboard. Western Digital introduced new hard drives in 1994 with enhancements to IDE interface and named it Enhanced IDE (EIDE). An IDE interface cable is shown in Fig 4.6.



Fig 4.6 IDE Interface Cable

ii. SATA Interface Cable

Serial Advanced Technology Attachment (SATA) is a new computer interface bus for connecting drives to computer. It was designed to replace EIDE bus interface. SATA bus interface is used in all the modern laptop and desktop computers. SATA drives communicate via high-speed serial cable. SATA bus interface has many advantages over older EIDE standard. These include faster and more efficient data transfer rate and reduced cable size and cost. SATA 1, SATA 2 and SATA 3 interfaces provide communications at rates of 1.5 GB/Sec, 3 GB/Sec and 6 GB/Sec respectively.



Fig 4.7 SATA Interface Cable

A SATA interface cable is shown in Fig 4.7.

6. Memory Slots

These are slots on the motherboard that connect RAM with the CPU. Generally, there are two memory slots. RAM cards are inserted in these slots. RAM card is a printed circuit board having a series of RAM chips mounted on it.

7. Disk Controller

Disk Controller is a circuit that allows communication between CPU and any type of drive such as floppy drive, hard drive or CD-ROM drive. Old disk controllers were implemented on a separate controller card. Modern disk controllers are integrated into the disk drive itself. For example, EIDE and SATA hard drives have their disk controller circuit inside the drives.

8. Cooling System

Cooling system is required to maintain proper operating temperature inside the system unit. Computer components installed inside the system unit and system unit produce heat when the computer is on. If the temperature inside the system unit reaches a certain point, it can damage the parts. A fan is fixed on top of the microprocessor to cool it down. Heat sinks are also used to dissipate the surface area. Many computers are designed to turn themselves off if the temperature exceeds certain level. A fan for cooling microprocessor is shown in Fig.4.8.



Fig 4.8 Fan for Cooling Microprocessor

9. Buses

A bus is a set of parallel wires that provides electrical path between various components of computer.

Types of buses

There are three types of buses, data bus, address bus and control bus, printed on the motherboard.

(i) Data bus

Data bus connects the CPU, memory and the other hardware devices on the motherboard.

(ii) Address bus

Address bus connects the CPU and RAM.

(iii) Control bus

Control bus is used to send control signals to all the components of the computer.

4.2 PORTS, EXPANSION CARDS AND MEMORY CHIPS

4.2.1 PORTS AND THEIR TYPES

Q.7 Explain types of ports.

Answer

Types of Ports

Various types of ports exist on the motherboard and they protrude at the back of the system unit for connecting devices. The following are different types of ports:

- Serial port
- Parallel port
- PS/2 port
- USB port
- Fire wire port
- HDMI port

1. Serial Port

Serial ports transmit one bit of data at a time. In old computers, serial ports had 9 or 25 pins in which one pin was used for transmitting data and the rest-transmitted signals and these were called COM1, COM2 and COM3. Generally, modems were connected to these ports. These ports have been replaced with USB ports.

A serial port is shown in Fig 4.9



Fig.4.9 Serial Port

2. Parallel Port

Parallel ports can transmit multiple bits over several wires at a time. These ports had 25 pins in which 8 pins emitted one byte of information and the others were used for transmitting control signals. Parallel ports were named as LPT1, LPT2 and LPT3. These ports have been replaced with USB ports.

A parallel port is shown in Fig.4.10

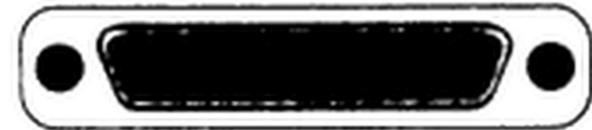


Fig.4.10 Parallel Port

3. PS/2 Port

PS/2 stands for IBM's Personal System 2 microcomputer. PS/2 system introduced a new type of port for connecting keyboard and mouse, which are still used in many computers. It is a round shaped serial port.

A PS/2 Port is shown in Fig.4.11



Fig.4.11 PS/2 Port

4. USB Port

USB stands for Universal Serial Bus. It provides very fast serial transmission. It is the most commonly used port in modern computers for connecting a large variety of devices to the computer such as printers, scanners, cameras, mouse, keyboard and USB flash drives. Computer has many USB ports and these are plug-and-play ports. Plug-and-play ports automatically detect and determine what type of device is attached to the computer. When a computer detects a plug-and-play device it automatically installs the driver for it or prompts the user to install it.

A USB port is shown in Fig.4.12.



Fig.4.12 USB Port

5. Fire Wire Port

It is a rectangular shaped port, generally used for connecting video devices such as camcorder to the computer. Fire wire port has four or six pins. In a six-pin connection, two extra pins are used to provide electric power. Laptop computers have 4-pin fire wire port because they do not provide electric power to devices connected to it.

A fire wire port is shown in Fig.4.13.



Fig.4.13 Fire Wire Port

6. HDMI Port

HDMI stands for High Definition Multimedia Interface. HDMI technology provides audio-video interface for transmitting digital data. All the high definition equipment including PCs, laptops, camcorders, digital cameras, TV, DVR, disk players and set-top box sold today have at least one HDMI port. HDMI port transmits high quality audio-video data in totally digital form through a single cable. HDMI port is shown in Fig 4.14.



Fig.4.14 HDMI Port

4.2.2 TYPES OF EXPANSION CARDS

Q.8 What is expansion card? Explain its types in detail.

Answer

Expansion Card

Expansion card is a printed circuit board that is inserted onto an expansion slot on the motherboard. It is also known as add-on card, interface card or just card. It gives new ability to computer such as connecting to another computer using a network cable.

Types of Expansion Cards

Four types of expansion cards are commonly used in computers. These are:

- Sound Card
- Video Graphics Card
- Modem Card
- Network Interface Card

1. Sound Card

The purpose of sound card is to facilitate transmission of sound in computer. In the past, beeps were the only sound that could be produced on the computer. With the invention of sound cards in the 1980s, we can store human voice in the computer and hear it through the speakers. Sounds are analog waves, whereas, computers communicate using electrical pulses that represent 0s and 1s. Sound card translate analog voice input from a microphone into digital form or it outputs the digital sound stored in the computer through the speakers. In other words, it provides analog to digital and digital to analog conversion as shown in Fig 4.15.

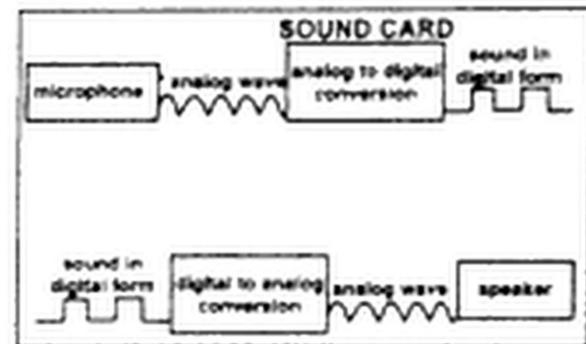


Fig. 4.15 Working of Sound Card

Without sound card

It will not be possible to play DVDs, CDs and run multimedia applications on a computer without the sound card. Early sound cards were installed in expansion slots on the motherboard. Motherboards of modern computers are manufactured with integrated sound cards.

2. Video Graphics Card

The purpose of a video graphics card is to display text, graphics and images on the screen. In the past, video cards were installed in expansion slots but in modern computers, video hardware is integrated on the motherboard is known as integrated graphics or on-board graphics. Integrated graphics uses some of the computer's RAM and reduces the total opacity. These motherboards have an AGP, PCI or PCI Express slot for adding a high performance graphics card in place of the integrated graphics. These high performance 3D graphics cards have their own dedicated memory, which is generally between 256 MB to 1 GB. Special high performance 3D graphics cards are required for running some video games. A video graphics card is shown in Fig.4.16.

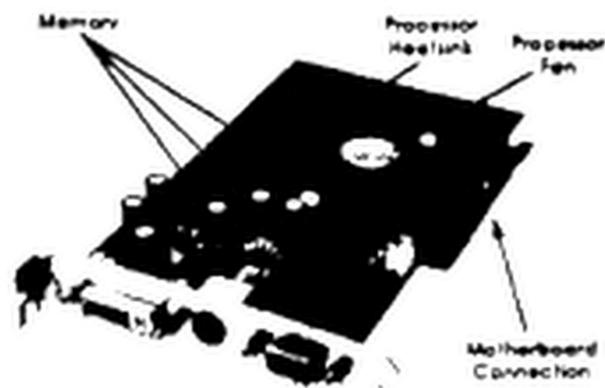


Fig 4.16 Videa Graphics Card

3. Modem Card

A modem is a communication device that makes possible the transmission of data between computers via telephone line or other communication lines. It is abbreviation of MODulator-DEModulator. Modems are generally used for dial-up connection to Internet. Modem cards are fixed in expansion slot or modem hardware is integrated on the motherboard.

Types of Modems

There are three types of modems.

- Dial-up modem
- ISDN modem
- DSL modem

(i) Dial-up modem

Dial-up modem use telephone lines and they can provide transmission speed up to 56 Kbps (Kilo bits per second) which is very slow. Therefore, their use is gradually declining. It has the advantage of providing Internet connection from any location in the world and it is the cheapest internet connection.

(ii) ISDN modem

ISDN modem is used with Integrated Services Digital Network. Here, "Integrated" means combining of voice and data services over the same wire. It uses the same phone lines that dial-modems use. It can provide Internet connection speed up to 128 Kbps.

(iii) DSL modem

DSL (Digital Subscriber Line) modem is used with DSL connection to the Internet. These modems are more advanced compared to dial-up and ISDN modems. They provide extremely fast Internet speed depending upon the package and services of Internet Service Provider (ISP).

Use of modems time to time

Dial-up and ISDN modems are gradually replaced by DSL modems for high-speed Internet connection using digital subscriber line. It also uses phone lines. DSL Internet connection is more expensive than dial-up and ISDN connections.

(iv) Network Interface Card

Network Interface Card (NIC), commonly known as network card or LAN card, is an expansion card that provides interface to a network. Modern computers have network interface integrated into the motherboard, just like the sound and graphics cards. Network card allows computer users to connect to each other either by using cables or wirelessly. It provides communication between computers in LAN and WAN.

Types of Network Cards

Following are the types of commonly used network cards:

- 10/100 Ethernet cards
- Gigabit card
- Wireless network card

1. 10/100 Ethernet cards

10/100 Ethernet cards are used in home and small offices. Their data transfer rate is 10 to 100

Mbps (Mega bits per second). They are usually attached to PCI or PCIe slots. A 10/100 Ethernet card is shown in Fig.4.17.

2. Gigabit card

Gigabit cards have data transfer rate of up to one Gbps (Giga bits per second). These cards are attached to computers using PCIe slot. A Gigabit card is shown in Fig 4.18

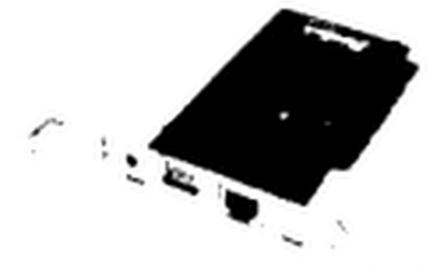


Fig4.17 10-100 Ethernet Card

3. Wireless network card

Wireless network cards are used for wireless networking. Their data transmission speed is generally less than wired cards. They are attached to PCIe slot or USB port. A wireless network card is shown in Fig.4.19.



Fig.4.19 Wireless Network Card

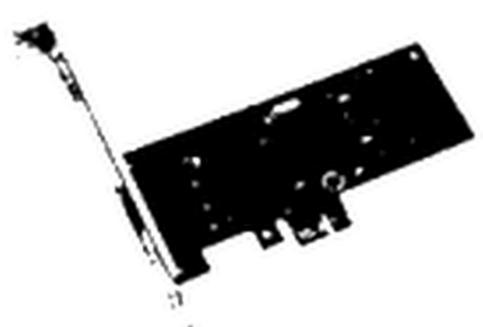


Fig 4.18 Gigabit Card

4.2.3 MEMORY CHIPS

Q.9 Explain the classification of memory chips.

Answer

Classification of memory chips

Memory chips can be classified into four categories:

- SIMM
- DIMM
- SDRAM
- DDR SDRAM

1. SIMM

SIMM stands for "Single In-line Memory Module". It is a small circuit board with a bunch of memory chips on it as shown Fig 4.20.



Fig 4.20 SIMM Memory

SIMM is plugged-in into particular socket on the motherboard. It is used to add memory to computer and is referred as Random Access Memory. SIMMs typically use up to 32-bit bus. They have storage capacity ranging from 256KB up to about 32MB. SIMMs were used in early computers of 80s and 90s.

2. DIMM

DIMM stands for "Dual In-line Memory Module". It is a type of computer memory. A DIMM is a small circuit board that holds memory chip. It uses a 64-bit bus to the memory, whereas, single in-line memory module (SIMM) only has a 32-bit path. This allows DIMMs to transfer more data at once. DIMMs have replaced SIMMs because they have faster data transfer rates and better capabilities than DIMMs. Memory capacities of DIMMs range from 64 MB up to 512 MB.



Fig.4.21 DIMM Memory

3. SDRAM

SDRAM stands for "Synchronous Dynamic Random Access Memory". SDRAM is an improvement to standard DRAM because it retrieves data alternately between two sets of memory. This eliminates the delay caused when one bank of memory addresses is shut down while another prepared for reading. It is called "Synchronous" DRAM because the memory is synchronized clock speed that the computer's CPU bus speed is optimized for. The faster is the bus speed, the faster will be the SDRAM.



Fig.4.22 SDRAM

4. DDR SDRAM

DDR SDRAM (Double Data Rate SDRAM) is synchronous dynamic RAM that has improved memory clock speed as compared to simple SDRAM. It reads or writes two consecutive words per clock cycle. New type of SDRAMs, known as DDR 2 and DDR 3 have also come which are used in latest microcomputers.



Fig.4.23 DDR SDRAM

Difference between DDR 2 and DDR 3

DDR 2 reads or writes 4 words of data per clock cycle, whereas, DDR 3 reads or writes 8 data words per clock cycle.

KEY POINTS

- Computer casing is a box that contains most of the components of a computer.
- Computer casing with all the components installed inside it is called system unit or main unit of computer.
- Power supply is used in computer to convert Alternating Current (AC) to low voltage Direct Current (DC) for operation of components of the computer.
- Motherboard or main board is a circuit board that connects all the components of computer system through ports, cables or expansion slots.
- Disk Controller is a circuit on the motherboard that allows communication between CPU and any type of drive such as hard drive or CD drive.
- Computers have various types of ports on the motherboard that protrude at the back of the system unit for connecting devices.
- Serial ports transmit one bit of data at a time over a single wire, whereas, parallel ports transfer multiple bits over several wires at the same time.
- Expansion card is a printed circuit board that is inserted onto an expansion slot on the motherboard. It is also known as add-on card, interface card or just card.
- Commonly used expansion cards are sound card, modem card, network interface card and graphics card. In modern computers, these cards are integrated on the motherboard.
- SIMM stands for Single In-line Memory Module. SIMM is a small circuit board on which RAM chips are wired together.
- DIMM stands for Dual In-line Memory Module. It is also a small circuit board like SIMM but it provides wider data bus and has more storage capacity.

EXERCISE

Q.1 Select the best answer for the following MCQs.

- i. Which port is generally used to connect video devices to the computer?
A. Fire wire port B. USB port C. PS/2 port D. Parallel port
- ii. What is computer casing with all the components installed inside it called?
A. Computer System B. CPU C. Motherboard D. System unit
- iii. What is the interface that provides connection to external devices called?
A. Expansion slot B. Memory slot C. Disk controller D. Port

