Biyani's Group of Girls' Colleges

PRE-UNIVERSITY EXAM

Class-BCA-I YEAR-Solution

SET-B

Time: 3Hrs SUBJECT.-Computer Organization MM 100

Each Question Carry 2 Marks

Very Short type Question:-

Q-1 What is Expansions Slots and Cards ?

Ans-1In computing, the expansion card, expansion board, adapter card or accessory card is a printed circuit board that can be inserted into an electrical connector, or expansion slot, on a**computer motherboard**, **backplane** or riser card to add functionality to a **computer** system via the expansion bus.

Q-2 What is CPU ?

Ans-2The CPU (Central Processing Unit) is the part of a computer system that is commonly referred to as the "brains" of a computer. The CPU is also known as theprocessor or microprocessor. The CPU is responsible for executing a sequence of stored instructions called a program.

Q-3 What is CMOS?

Ans3:-CMOS (complementary metal-oxide semiconductor) is the semiconductor technology used in the transistors that are manufactured into most of today's computer microchips. In CMOS technology, both kinds of transistors are used in a complementary way to form a current gate that forms an effective means of electrical control.

Q-4 What is flash memory?

Ans-4Flash memory, also known as flash storage, is a type of nonvolatile memory that erases data in units called blocks. A block stored on a flash memory chip must be erased before data can be written or programmed to the microchip

Q-5 Define magnetic tape and disk?

Ans5:-Magnetic tape is a medium for magnetic recording, made of a thin, magnetizablecoating on a long, A magnetic disk is a storage device that uses a magnetization process to write, rewrite and access data.Tape is faster than disk when performing streaming read/write operations, but content on magnetic tape can only be read or written in a sequential format by spooling it to the appropriate position. In contrast to disk, where access times are measured in milliseconds, tape access times can be seconds

Q-6 Write about the Track, Cylinder, Sector.

Ans6:-A disk is divided into **tracks**, **cylinders**, and **sectors**. A **track** is that portion of a disk which passes under a single stationary head during a disk rotation, a ring 1 bit wide. A **cylinder** is comprised of the set of **tracks** described by all the heads (on separate platters) at a single seek positiona **sector** is a subdivision of a **track** on a magnetic disk or optical disc

Q-7 What is port and cable?

Ans7:-a computer **port** is a specialized outlet on a piece of equipment to which a plug or **cable**connects. Electronically, the several conductors where the**port and cable** contacts connect, provide a method to transfer signals between devices.

Q-8 What is network adaptor?

Ans8:A **network adapter** is the component of a computer's internal hardware that is used for communicating over a **network** with another computer. It enable a computer to connect with another computer, server or any **networking** device over an LAN connection. A **network adapter** can be used over a wired or wireless **network**.

Q-9 What is memory buffer register?

Ans9:-A **memory buffer register** (MBR) or **memory** data **register** (MDR) is the **register** in a computer's processor, or central processing unit, CPU, that stores the data being transferred to and from the immediate access storage. It contains the copy of designated **memory** locations specified by the **memory** address **register**.

Q-10What is stack pointer? Explain stack pointer in brief.

Ans-10A **stack pointer** is a small register that stores the address of the last program request in a **stack**. A **stack** is a specialized buffer which stores data from the top down. As new requests come in, they "push down" the older ones.

Each Question Carry 5 Marks

Short answer type Question:-

Q-1 Explain intel 810 chipset.

Ans-1The **Intel i810** chipset was released by Intel in early 1999 with the code-name "Whitney[1]" as a platform for the P6-based Socket 370 CPU series, including the Pentium III and Celeron processors. Some motherboard designs include Slot 1 for older Intel CPUs or a combination of both Socket 370 and Slot 1. It targeted the low-cost segment of the market, offering a robust platform for uniprocessor budget systems with integrated graphics. The 810 was Intel's first chipset design to incorporate a hub architecture which was claimed to have better I/O throughput

Q-2 What is instruction set and execution cycle?

Ans-2The **instruction set**, also called **instruction set** architecture (ISA), is part of a computer that pertains to programming, which is basically machine language. The**instruction set** provides commands to the processor, to tell it what it needs to do.An instruction **cycle** (also known as the fetch–decode–**execute cycle** or the fetch-**execute cycle**) is the basic operational process of a computer. It is the process by which a computer retrieves a program instruction from its memory, determines what actions the instruction dictates, and carries out those actions.

Q-3What is SRAM and DRAM Define and differentiate it.

Ans3:-**SRAM** (static RAM) is random access memory (RAM) that retains data bits in its memory as long as power is being supplied. Unlike dynamic RAM (**DRAM**), which stores bits in cells consisting of a capacitor and a transistor, **SRAM** does not have to be periodically refreshed.A flip-flop for a memory cell takes 4 or 6 transistors along with some wiring, but never has to be refreshed. This makes **static RAM** significantly faster than **dynamic RAM**. Therefore you get less memory per chip, and that makes **static RAM** a lot more expensive

Q-4What is Register Transfer Language?

Ans4:-n digital circuit design, register-transfer level (**RTL**) is a design abstraction which models a synchronous digital circuit in terms of the flow of digital signals (data) between hardware registers, and the logical operations performed on those signals.In computer science, **register transfer language**(RTL) is a kind of intermediate representation (IR) that is very close to assembly **language**, such as that which is used in a compiler. It is used to describe data flow at the **register**-**transfer** level of an architecture.

Q-5 What is Memory module? Define it's different types.

- **Ans-5**A **memory module** is a circuit board that contains DRAM integrated circuits that are installed into the**memory** slot on a computer motherboard. Below is an image of a 512 MB DIMM computer **memory module**and the most common type of **memory** used today. TransFlash Memory Module.
- SIMM, a single in-line memory module.

- DIMM, dual in-line memory module. Rambus memory modules are a subset of DIMMs, but are usually referred to as RIMMs. SO-DIMM, small outline DIMM, a smaller version of the DIMM, used in laptops.

Each Question Carry 12 Marks

Q-1 Explain generation of computers with characteristics?

Ans-1**Generation** in **computer** terminology is a change in technology a**computer** is/was being used. Initially, the **generation** term was used to distinguish between varying hardware technologies. Nowadays, **generation** includes both hardware and software, which together make up an entire **computer** system.

- 1940 – 1956: First Generation – Vacuum Tubes. These early computers used vacuum tubes as circuitry and magnetic drums for memory. ...
- 1956 – 1963: Second Generation – Transistors. ...
- 1964 – 1971: Third Generation – Integrated Circuits. ...
- 1972 – 2010: Fourth Generation – Microprocessors.

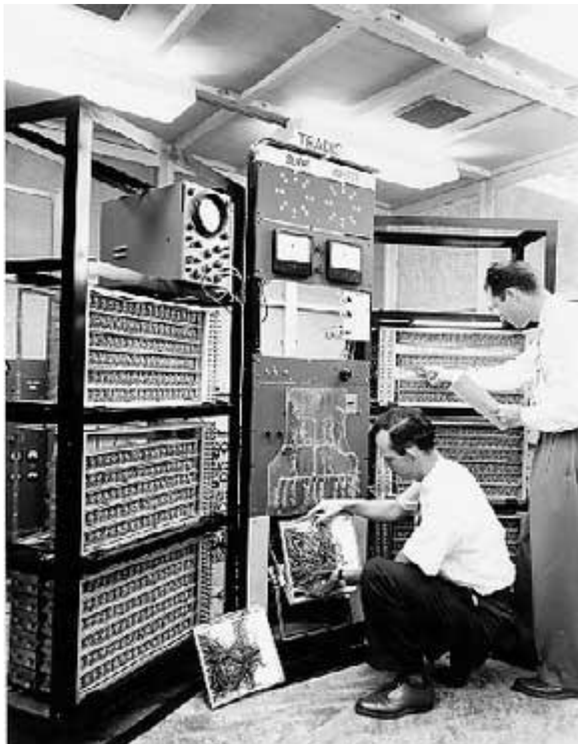
First Generation:-

- The period of first generation was from 1946-1959. The computers of first generation used vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit). These tubes, like electric bulbs, produced a lot of heat and the installations used to fuse frequently. Therefore, they were very expensive and only large organizations were able to afford it.
- In this generation, mainly batch processing operating system was used. Punch cards, paper tape, and magnetic tape was used as input and output devices. The computers in this generation used machine code as the programming language

The main features of the first generation are −

- Vacuum tube technology
- Unreliable
- Supported machine language only
- Very costly
- Generated a lot of heat
- Slow input and output devices
- Huge size

- Need of AC
- Non-portable
- Consumed a lot of electricity



Some computers of this generation were −

- ENIAC
- EDVAC
- UNIVAC
- IBM-701
- IBM-650

Second generation:-

Second Generation: Transistors (**1956**-**1963**) The world would see transistors replace vacuum tubes in the second generation of computers. The transistor was invented at Bell Labs in **1947** but did not see widespread use in computers until the late **1950s**

The period of second generation was from 1959-1965. In this generation, transistors were used that were cheaper, consumed less power, more compact in size, more reliable and faster than the first generation machines made of vacuum tubes. In this generation, magnetic cores were used as the primary memory and magnetic tape and magnetic disks as secondary storage devices.

In this generation, assembly language and high-level programming languages like FORTRAN, COBOL were used. The computers used batch processing and multiprogramming operating system.

The main features of second generation are −

- Use of transistors
- Reliable in comparison to first generation computers
- Smaller size as compared to first generation computers
- Generated less heat as compared to first generation computers
- Consumed less electricity as compared to first generation computers
- Faster than first generation computers
- Still very costly
- AC required
- Supported machine and assembly languages

Some computers of this generation were −

- IBM 1620
- IBM 7094
- CDC 1604
- CDC 3600
- UNIVAC 1108

Third Generation:-**Third Generation**: Integrated Circuits (1964-1971) The development of the integrated circuit was the hallmark of the **third generation of computers**. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of**computers**. The period of third generation was from 1965-1971. The computers of third generation used Integrated Circuits (ICs) in place of transistors. A single IC has many transistors, resistors, and capacitors along with the associated circuitry.

The IC was invented by Jack Kilby. This development made computers smaller in size, reliable, and efficient. In this generation remote processing, time-sharing, multiprogramming operating system were used. High-level languages (FORTRAN-II TO IV, COBOL, PASCAL PL/1, BASIC, ALGOL-68 etc.) were used during this generation.

The main features of third generation are −

- IC used
- More reliable in comparison to previous two generations
- Smaller size
- Generated less heat
- Faster
- Lesser maintenance
- Costly
- AC required
- Consumed lesser electricity
- Supported high-level language

Some computers of this generation were −

- IBM-360 series
- Honeywell-6000 series
- PDP (Personal Data Processor)
- IBM-370/168
- TDC-316

Fourth Generation:-

The period of fourth generation was from 1971-1980. Computers of fourth generation used Very Large Scale Integrated (VLSI) circuits. VLSI circuits having about 5000 transistors and other circuit elements with their associated circuits on a single chip made it possible to have microcomputers of fourth generation.

Fourth generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to Personal Computer (PC) revolution. In this generation, time sharing, real time networks, distributed operating system were used. All the high-level languages like C, C++, DBASE etc., were used in this generation.

The main features of fourth generation are −

- VLSI technology used
- Very cheap
- Portable and reliable
- Use of PCs
- Very small size
- Pipeline processing
- No AC required
- Concept of internet was introduced
- Great developments in the fields of networks
- Computers became easily available

Some computers of this generation were −

- DEC 10
- STAR 1000
- PDP 11

- CRAY-1(Super Computer)
- CRAY-X-MP(Super Computer)

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. The period of fifth generation is 1980-till date. In the fifth generation, VLSI technology became ULSI (Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components.

This generation is based on parallel processing hardware and AI (Artificial Intelligence) software. AI is an emerging branch in computer science, which interprets the means and method of making computers think like human beings. All the high-level languages like C and C++, Java, .Net etc., are used in this generation.

AI includes −

- Robotics
- Neural Networks
- Game Playing
- Development of expert systems to make decisions in real-life situations

- Natural language understanding and generation

The main features of fifth generation are −

- ULSI technology
- Development of true artificial intelligence
- Development of Natural language processing
- Advancement in Parallel Processing
- Advancement in Superconductor technology
- More user-friendly interfaces with multimedia features
- Availability of very powerful and compact computers at cheaper rates

Some computer types of this generation are −

- Desktop
- Laptop
- NoteBook
- UltraBook
- ChromeBook

Q-2 Define different types of input and output devices and explain each device within detail.

Ans-2The devices which are used to input the data and the programs in the computer are known as "**Input Devices**". or Input device can read data and convert them to a form that a computer can use. **Output Device** can produce the final product of machine processing into a form usable by humans. It provides man to machine communication. Some of the I/O devices are explained below:

(1) **Keyboard** : Keyboard is used in the input phase of a computer-based information system. Keyboard is most common input device is used today. The data and instructions are input by typing on the keyboard. The message typed on the keyboard reaches the memory unit of a computer. It's connected to a computer via a cable. Apart from alphabet and numeral keys, it has other function keys for performing different functions.

(2) **Mouse** : It's a pointing device. The mouse is rolled over the mouse pad, which in turn controls the movement of the cursor in the screen. We can click, double click or

drag the mouse. Most of the mouse's have a ball beneath them, which rotates when the mouse in moved. The ball has 2 wheels of the sides, which in turn mousse with the movement of the ball. The sensor notifies the speed of its movements to the computer, which in turn moves the cursor/pointer on the screen.

(3) **Scanner** : Scanners are used to enter information directly in to the computers memory. This device works like a Xerox machine. The scanner converts any type of printed or written information including photographs into digital pulses, which can be manipulated by the computer.

(4) **Track Ball** : Track ball is similar to the upside- down design of the mouse. The user moves the ball directly, while the device itself remains stationary. The user spins the ball in various directions to effect the screen movements.

(5) **Light Pen** : This is an input device which is used to draw lines or figures on a computer screen. It's touched to the CRT screen where it can detect raster on the screen as it passes.

(6) **Optical Character Rader** : It's a device which detects alpha numeric characters printed or written on a paper. The text which is to be scanned is illuminated by a low frequency light source. The light is absorbed by the dark areas but reflected from the bright areas. The reflected light is received by the photocells.

(7) **Bar Code Reader** : This device reads bar codes and coverts them into electric pulses to be processed by a computer. A bar code is nothing but data coded in form of light and dark bars.

(8) **Voice Input Systems** : This devices converts spoken words to M/C language form. A micro phone is used to convert human speech into electric signals. The signal pattern is then transmitted to a computer when it's compared to a dictionary of patterns that have been previously placed in a storage unit of computer. When a close match is found, the word is recognized.

(9) **Plotter** : Plotter is an O/P device that is used to produce graphical O/P on papers. It uses single color or multi color pens to draw pictures as blue print etc.

(10) **Digital Camera** : It converts graphics directly into digital form. It looks like an ordinary camera, but no film is used therein, instead a CCD (changed coupled Divide) Electronic chip in used. When light falls, on the chip though the lens, it converts light waves into electrical waves.

OUTPUT DEVICES: An **output device** is any peripheral that receives data from a computer, usually for display, projection, or physical reproduction. For example, the image shows an inkjet printer, an output device that can make a hard copy of any information shown on your monitor, which is another example of an output device. Monitors and printers are two of the most common output devices used with a computer.

Monitor (LED, LCD, CRTetc):- A **monitor** may refer to any of the following:

1.Alternatively referred to as a **video display terminal (VDT)** and **video display unit (VDU)**, a **monitor** is an output device that displays video images and text. A monitor is made up of circuitry, a screen, a power supply, buttons to adjust screen settings, and casing that holds all of these components.

Like most early TVs, the first computer monitors were comprised of a CRT (Cathode Ray Tube) and a fluorescent screen. Today, all monitors are created using flat panel display technology, usually backlit with LEDs. The image to the right shows an ASUS LCD monitor.

Printers (all types):- A **printer** is an external hardware output device that takes the electronic data stored on a computer or other device and generates a hard copy of it. For example, if you created a report on your computer you could print several copies to hand out at a staff meeting. Printers are one of the most popular computer peripherals and are commonly used to print text and photos. The picture to the right is an example of an inkjet computer printer, the Lexmark Z605.

Types of printers

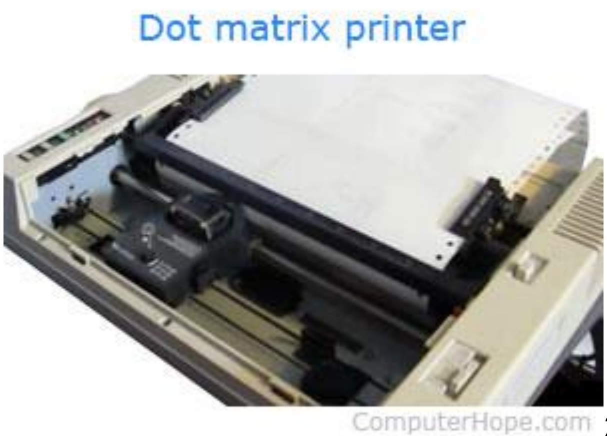
Below is a list of all the different types of computer printers. Today, the most common printers used with a computer are Inkjet and Laser printers.

- 3D printer:-3D printers are used in many disciplines--aerospace engineering, dentistry, archaeology, biotechnology, and information systems are a few examples of industries that utilize them. As an example, a 3D printer might be used in the field of archaeology to physically reconstruct ancient artifacts that have been damaged over time.

- All-in-one (AIO) printer:-Alternatively referred to as a **Multifunction printer**(**MFP**), **AIO** is short for **All-In-One**. It is used to describe a hardware device such as an all-in-one printerthat is a printer, fax, and scanner all in one device. The picture is an example of a Samsung all-in-one printer that is a fax, laser printer, sheetfed scanner, and flatbed scanner.

Dot matrix printer:- **Dot matrix** may refer to any of the following:

1. The term **dot matrix** refers to the process of using dots to form an image. In a dot matrix image, the quality is determined by the number of dots per inch.



2. Alternatively referred to as a **pin printer**, **dot matrix printers** were first introduced by IBM in 1957. However, the first dot matrix impact printer was created by Centronics in 1970. Dot matrix printers use print heads to shoot ink or strike an ink ribbon to place hundreds to thousands of little dots to form text and images. Today, dot matrix printers are utilized far less than they used to be due to their low quality images and slow print speed when compared to ink jet printers and laser printers. However, they still see a lot of use in certain sectors such as auto-part stores and package delivery companies.

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Inkjet printer:- The most popular printer for home computer users that prints by spraying streams of quick-drying ink on paper. The ink is stored in disposable ink cartridges, often a separate cartridge is used for each of the major colors. These colors are usually Black, Red/Magenta, Green/Cyan, and Yellow (CMYK). The picture is an example of a computer inkjet printer.

Although **inkjet printers** themselves are often relatively inexpensive, the ink cartridges used in the printers can increase the overall cost of the printer.

Lexmark Inkjet Printer

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ComputerHope.com

Laser printer:-The **laser printer** was first developed at Xerox PARC by Gary Starkweather and released in 1971 that utilizes laser technology to print images on the paper. Laser printers are often used for corporate, school, and other environments that require print jobs to be completed quickly and in large quantities. In the picture, is a Lexmark C782n laser printer and a good example of a laser printer. As the image shows, a laser printer is usually larger than an inkjet printer found in most Below is a chart of the steps a laser printer takes to print.

Cleaning

This process removes the prior image information and toner from the drum.

Conditioning

The corona wire applies a uniform, positive charge to the photoreceptor drum.

Writing

The image to be printed is drawn onto the drum by using a laser to "carve out" positive charges and leave behind negative ones. As an aside, the laser in the printer uses light sources like LED or LCS (Liquid Crystal Shutter).

Developing

The toner in the ink roller is ionized with a positive charge so that it will be attracted to the areas on the drum previously given a negative charge by the laser.

Transfer

The toner of the drum is transferred to the paper by either a positively ionized field (created by a transfer corona wire) or by a transfer roller in newer printers. The toner is not yet permanently set on the paper and requires the last stage.

Plotter:- A **plotter** is a computer hardware device much like a printer that is used for printing vector graphics. Instead of toner, plotters use a pen, pencil, marker, or another writing tool to draw multiple, continuous lines onto paper rather than a series of dots like a traditional printer. Though once widely used for computer-aided design, these devices have more or less been phased out by wide-format printers. Plotters are used to produce a hard copy of schematics and other similar applications.
Advantages of plotters

- Plotters can work on very large sheets of paper while maintaining high resolution.
- They can print on a wide variety of flat materials including plywood, aluminum, sheet steel, cardboard, and plastic.
- Plotters allow the same pattern to be drawn thousands of times without any image degradation.
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Thermal printer:- A **thermal printer** may refer to any of the following:

1. A **thermal impact printer** or **electrothermal printer** is a printer that uses heated pins to "burn" images onto heat-sensitive paper. These printers are commonly used in calculators and fax machines; and although they are inexpensive and print relatively fast, they produce low resolution print jobs.
2. A **thermal printer**, **thermal transfer printer**, or **thermal wax-transfer printer** uses thermal wax ribbon to melt colored wax on paper for a photo print. It was invented by Jack Kilby.

Speaker(s):- A **speaker** may refer to any of the following:

1. A **speaker** is a term used to describe the user who is giving vocal commands to a software program.
2. A **computer speaker** is a hardware device that connects to a computer to generate sound. The signal used to produce the sound that comes from a computer speaker is created by the computer's sound card. The picture shows the Harman KardonSoundsticks III 2.1 Channel Multimedia Speaker System.

Projector:- A **projector** is an output device that can take images generated by a computer or Blu-ray player and reproduce them onto a screen, wall, or other surface. Typically, the surface projected onto is large, flat, and lightly colored. For example, you could use a projector to show a presentation on a large screen so that everyone in the room can see it. Projectors can produce either still (slides) or moving images (videos)

. How is a projector used today?

- When was the first projector invented?
- How does a projector get its input?
- Related projector pages.

Q-3 Write short note on the following:

(a)DMA:-Direct memory access (DMA) is a method that allows an input/output (I/O) device to send or receive data directly to or from the main memory, bypassing the CPU to speed up memory operations. The process is managed by a chip known as a DMA controller (DMAC).Stands for "Direct Memory Access." DMA is a method of transferring data from the computer's RAM to another part of the computer without processing it using the CPU. While most data that is input or output from your computer is processed by the CPU, some data does not require processing, or can be processed by another device. In these situations, DMA can save processing time and is a more efficient way to move data from the computer's memory to other devices.

For example, a sound card may need to access data stored in the computer's RAM, but since it can process the data itself, it may use DMA to bypass the CPU. Video cards that support DMA can also access the system memory and process graphics without needing the CPU. Ultra DMA hard drives use DMA to transfer data faster than previous hard drives that required the data to first be run through the CPU.

In order for devices to use direct memory access, they must be assigned to a DMA channel. Each type of port on a computer has a set of DMA channels that can be assigned to each connected device. For example, a PCI controller and a hard drivecontroller each have their own set of DMA channels.

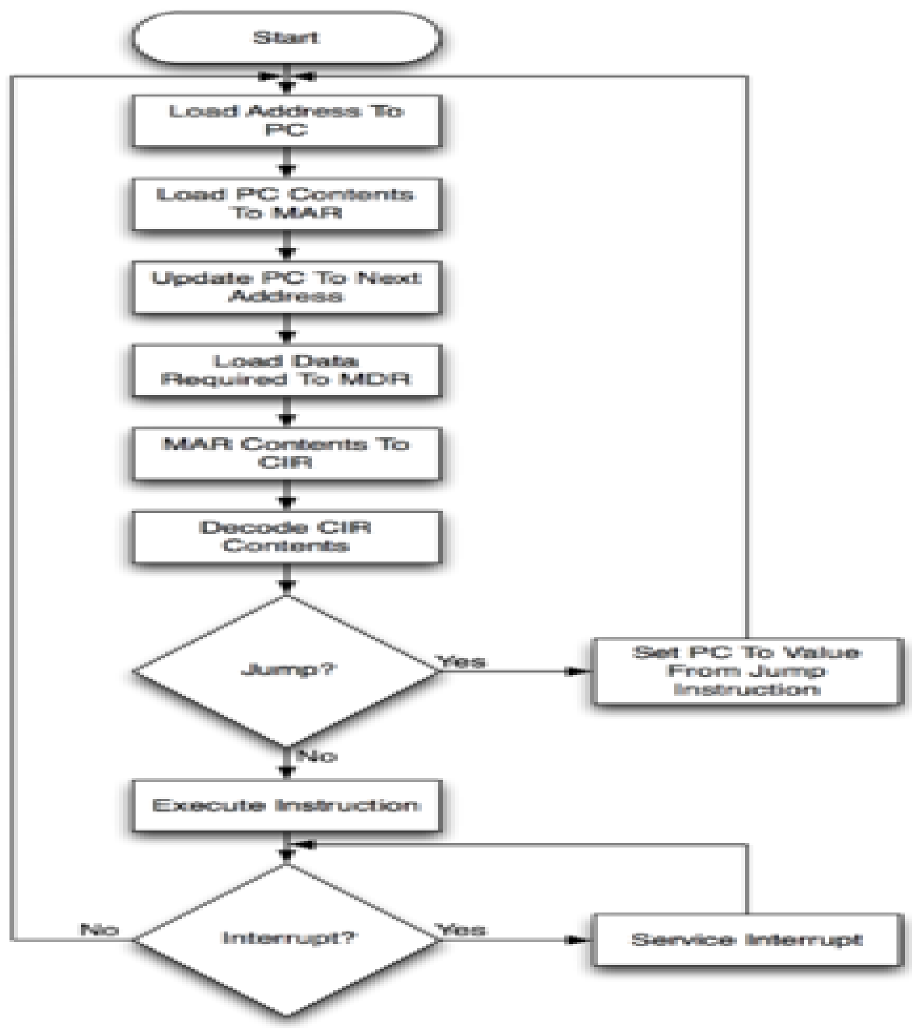
(b)Instruction Cycle:-An instruction cycle (also known as the fetch–decode–execute cycle or the fetch-execute cycle) is the basic operational process of a computer. It is the process by which a computer retrieves a program instruction from its memory, determines what actions the instruction dictates, and carries out those actions. This cycle is repeated continuously by a computer's central processing unit (CPU), from boot-up to when the computer is shut down.

In simpler CPUs the instruction cycle is executed sequentially, each instruction being processed before the next one is started. In most modern CPUs the instruction cycles are instead executed concurrently, and often in parallel, through an instruction pipeline: the next instruction starts being processed before the previous instruction has finished, which is possible because the cycle is broken up into separate steps.Each computer's CPU can have different cycles based on different instruction sets, but will be similar to the following cycle:

1. Fetch the instruction: The next instruction is fetched from the memory address that is currently stored in the program counter and stored into the instruction register. At the end of the fetch operation, the PC points to the next instruction that will be read at the next cycle.
2. Decode the instruction: During this cycle the encoded instruction present in the instruction register is interpreted by the decoder.
3. Read the effective address: In the case of a memory instruction (direct or indirect) the execution phase will be during the next clock pulse. If the instruction has an indirect address, the effective address is read from main memory, and any required data is fetched from main memory to be processed and then placed into data registers (clock pulse: T3). If the instruction is direct, nothing is done

during this clock pulse. If this is an I/O instruction or a register instruction, the operation is performed during the clock pulse.

4. Execute the instruction: The control unit of the CPU passes the decoded information as a sequence of control signals to the relevant function units of the CPU to perform the actions required by the instruction such as reading values from registers, passing them to the ALU to perform mathematical or logic functions on them, and writing the result back to a register. If the ALU is involved, it sends a condition signal back to the CU. The result generated by the operation is stored in the main memory or sent to an output device. Based on the feedback from the ALU, the PC may be updated to a different address from which the next instruction will be fetched.



(c)Client server computer:-A Computer networking model where one or more powerful computers (servers) provide the different computer network services and all other user'of computer network (clients) access those services to perform user's tasks is known as client/server computer networking model.

In such networks, there exists a central controller called server. A server is a specialized computer that controls the network resources and provides services to other computers in the network.

All other computers in the network are called clients. A client computer receives the requested services from a server.

• A server performs all the major operations like security and network management.

• All the clients communicate with each other via centralized server

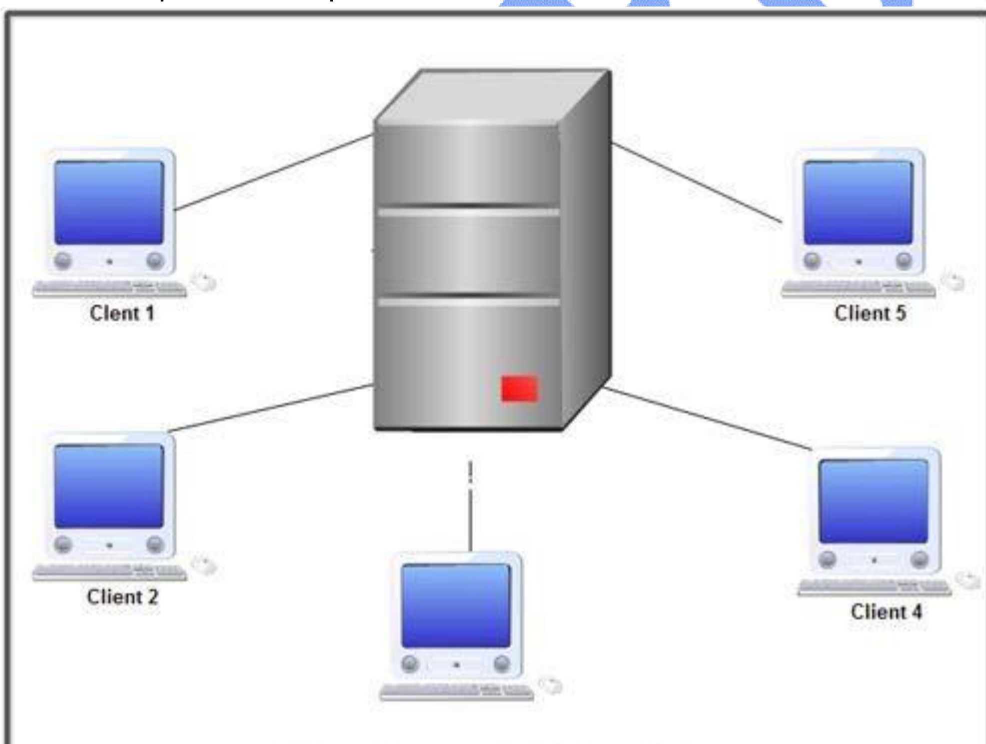
• If client 1 wants to send data to client 2, it first sends request to server to seek permission for it. The server then sends a signal to client 1 allowing it to initiate the communication.

• A server is also responsible for managing all the network resources such as files, directories,applications & shared devices like printer etc.

• If any of the clients wants to access these services, it first seeks permission from the server by sending a request.

• Most Local Area Networks are based on client server relationship.

Client-server networking became popular in the late 1980s and early 1990s as many applications were migrated from centralized minicomputers and mainframes to computer networks of persona computers.



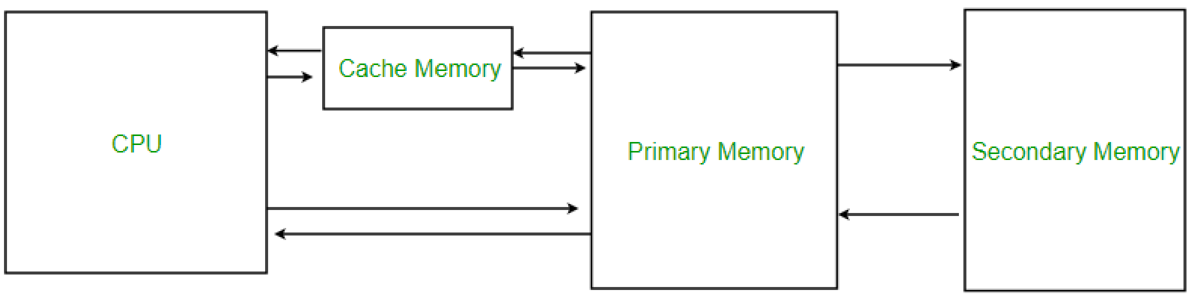
Client Server Relationship

The design of applications for a distributed computing environment required that they effetely be divided into two parts: client (front end) and server (back end). The network model on which they were implemented mirrored this client-server model with a user's PC (the client) typically acting as the requesting machine and a more powerful server machine to which it was connected via either a LAN or a WAN acting as the supplying machine. It requires special networking operating system. It provides user level security and it is more expensive.

(d)Cache memory, Primary, Virtual Memory:-

Cache memory is a small-sized type of volatile computer memory that provides high-speed data access to a processor and stores frequently used computer programs, applications and data. It is the fastest memory in a computer, and is typically integrated onto the motherboard and directly embedded in the processor or main random access memory (RAM).As CPU has to fetch instruction from main memory speed of CPU depending on fetching speed from main memory. CPU contains register which has fastest access but they are limited in number as well as costly. Cache is cheaper so we can access cache. Cache memory is a very high speed memory that is placed between the CPU and main memory, to operate at the speed of the CPU.

It is used to reduce the average time to access data from the main memory. The cache is a smaller and faster memory which stores copies of the data from frequently used main memory locations. Most CPUs have different independent caches, including instruction and data.



When the processor needs to read or write a location in main memory, it first checks for a corresponding entry in the cache.

- If the processor finds that the memory location is in the cache, a **cache hit** has occurred and data is read from chache
- If the processor **does not** find the memory location in the cache, a **cache miss** has occurred. For a cache miss, the cache allocates a new entry and copies in data from main memory, then the request is fulfilled from the contents of the cache.

The performance of cache memory is frequently measured in terms of a quantity called **Hit ratio.**

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Hit ratio = hit / (hit + miss) =  no. of hits/total accesses
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We can improve Cache performance using higher cache block size, higher associativity, reduce miss rate, reduce miss penalty, and reduce Reduce the time to hit in the cache.

Primary memory is computer **memory** that a processor or computer accesses first or directly. It allows a processor to access running execution applications and services that are temporarily stored in a specific **memory** location. **Primary memory** is also known as **primary** storage or main **memory**.Primary memory is computer memory that a processor or computer accesses first or directly. It allows a processor to access running execution applications and services that are temporarily stored in a specific memory location.

Primary memory is also known as primary storage or main memory.Primary memory is a computer system's volatile storage mechanism. It may be random access memory (RAM), cache memory or data buses, but is primarily associated with RAM.

As soon as a computer starts, primary memory loads all running applications, including the base operating system (OS), user interface and any user-installed and running software utility. A program/application that is opened in primary memory interacts with the system processor to perform all application-specific tasks.Primary memory is considered faster than secondary memory

Virtual memory is a memory management capability of an OS that uses hardware and software to allow a computer to compensate for physical memory shortages by temporarily transferring data from random access memory (RAM) to disk storage. Virtual address space is increased using active memory in RAM and inactive memory in hard disk drives (HDDs) to form contiguous addresses that hold both the application and its data.

Computers have a finite amount of RAM so memory can run out, especially when multiple programs run at the same time. A system using virtual memory can load larger programs or multiple programs running at the same time, allowing each one to operate as if it has infinite memory and without having to purchase more RAM.

As part of the process of copying virtual memory into physical memory, the OS divides memory into pagefiles or swap files that contain a fixed number of addresses. Each page is stored on a disk and when the page is needed, the OS copies it from the disk to main memory and translates the virtual addresses into real addresses.

Q-4What do you mean by addressing techniques and addressing mode? Explain each addressing technique in detail?

Ans-4 **Addressing techniques-** Addressing modes are the method used to determine which part of memory is being referred to by a machine instruction. There are various types of addressing modes. Which addressing mode is used is dependent on what type of computer architecture is being used.

Random access memory (RAM) is the primary area of memory for a computer. This is where any application must be loaded to if it is to be run. The central processing unit (CPU) reads machine instructions from the RAM and acts on those instructions. This is what happens whenever any application is run on a computer.

The machine instructions given to the CPU often must refer to specific portions of the RAM. In order to do this, the CPU must have a way of knowing which portion of RAM the machine instruction is referring to. This is where addressing modes come into play.

Addressing modes are used to divide up the sections of RAM into individual portions that may be referenced individually. This is similar to how each house has an address. This address can then be used by a machine instruction to refer to a specific portion of memory. The CPU will then access that portion of memory and perform the action specified by the machine instruction.

There are many different types of addressing modes. Different types of computer architecture feature different types of addressing modes. This results in an incompatibility of software. If an application is designed for one type of addressing mode, then it will not be able to run when used on a system that uses a different type of addressing mode. It will be much like speaking to someone in a language he does not understand.

The specifics of each type of addressing mode are important for computer programmers using assembly language. This type of computer language is a direct representation of the machine instructions sent to the CPU. This is what makes assembly language able to produce programs that can run several times faster than other programming languages.

Assembly language is used in the development of operating systems. A computer programmer must know the type of addressing modes used on the specific computer architecture before he can write a functioning operating system or application in assembly. The differences between addressing modes are part of the reason that applications are unable to run on different computer architectures.

Direct addressing- In direct addressing mode, effective address of the operand is given in the address field of the instruction. It requires one memory reference to read the operand from the given location and provides only a limited address space. Length of the address field is usually less than the word length.

Ex : Move P, Ro, Add Q, Ro P and Q are the address of operand.

Indirect addressing - Indirect addressing mode, the address field of the instruction refers to the address of a word in memory, which in turn contains the full length address of the operand. The advantage of this mode is that for the word length of N, an address space of 2N can be addressed. He disadvantage is that instruction execution requires two memory reference to fetch the operand Multilevel or cascaded indirect addressing can also be used.

Immediate addressing - This is the simplest form of addressing. Here, the operand is given in the instruction itself. This mode is used to define a constant or set initial values of variables. The advantage of this mode is that no memory reference other than instruction fetch is required to obtain operand. The disadvantage is that the size of the number is limited to the size of the address field, which most instruction sets is small compared to word length.

Relative addressing - This is a combination of direct addressing and register indirect addressing. The value contained in one address field. A is used directly and the other address refers to a register whose contents are added to A to produce the effective address.

Indexed addressing- It is also known as direct addressing mode. When you know the right offset of the address of the memory you need. For example if you have an array, then if you need the N-th element of the array, you just add N sizes of the variables to the starting address of the array.

As an oposite it is the sequential addressing mode (or indirect) where you cant calculate the exact address by just offset of the beginning. If the size of each element in the array is not known (for example if you have N null terminated string which size is not known) you need to traverse all the N-1 elements until you find the one you need - the N-th one :)

Registers –

Indexed register – computer's cpu is a processor register used for modifying operand addresses during the run of a program, typically for doing vector/array oprations. Index register were first used in the British Manchester mark 1 computer,in 1949.

Index register are used for a special kind of addressing where an immdiate constant (i.e., which is part of the instruction it self) is added to the content of a register to form the actual operands or data; architecture which allow more then one register to be used this way nuturally have an opcode field for specifiying which register to use.

General purpose register –

Store data (arguments and result of instructions.) can be assinged variety of user programmes.

Special purpose register –

Responsible for storing information that is essential for running DLX programs. Types are

- The instruction register: hold the instruction that is to be executed.
- The program counter: keeps address of the next instruction so that a copy of the instruction can be placed in the current instruction register.

Overflow register – that the signed result of an opretion is too large to fit in the register width using twos complement representation.

Carry register –store numbers large than a single word to be added /subtracted by carrying a binary digit from a less significant word to the large significent bit of a more significent word as needed.it is also used to extend bit shifts and rotates in a similar manner on many processor.

Shift register –the shift register is another type of sequential logic circuit that is used for the storage or transfer of data in the form of binary numbers and than “shift” the data out once every clock cycle, hence the name shift register.it basically consists of several single bit “D-type data latches”, one for each bit (0-1) connected together in a serial or daisy-chain arrangment so that the output from one data latch becomes the input of the next latch and so on. The data bits may be fed in or out of the register serially,i.e. one after the other from either the left or the right direction, or in parllel,i.e. all together. The number of individual data latches required to make up a singnal shift register is determinde by the number of bits to be stored with the most common being 8-bits wide.

Stack register – A stack can be orgnized as a collection of finite number of register that are used to store temporary information during the execution of a program. The stack pointer(sp)is a register that holds the address of top of element of the stack.

Memory Buffer register- A **Memory Buffer Register** (MBR) is the register in a computer's processor, or central processing unit, CPU, that stores the data being transferred to and from the immediate access store. It acts as a buffer allowing the processor and memory units to act independently without being affected by minor differences in operation. A data item will be copied to the MBR ready for use at the nextclock cycle, when it can be either used by the processor or stored in main memory.

This register holds the contents of the memory which are to be transferred from memory to other components or vice versa. A word to be stored must be transferred to the MBR, from where it goes to the specific memory location, and the arithmetic data to be processed in the ALU first goes to MBR and then to accumulated register, and then it is processed in the ALU.

Accumulators-Accumulators on a tabulating machine circa 1936. Each of the four registers can store a 10-digit decimal number.

In a computer's central processing unit (CPU), an accumulator is a register in which intermediatearithmetic and logic results are stored. Without a register like an accumulator, it would be necessary to write the result of each calculation (addition, multiplication, shift, etc.) to main memory, perhaps only to be read right back again for use in the next operation. Access to main memory is slower than access to a register like the accumulator because the technology used for the large main memory is slower (but cheaper) than that used for a register.

The canonical example for accumulator use is summing a list of numbers. The accumulator is initially set to zero, then each number in turn is read and added to the value in the accumulator. Only when all numbers have been added is the result held in the accumulator written to main memory or to another, non-accumulator, CPU register.

An **accumulator machine**, also called a 1-operand machine, or a CPU with accumulator-based architecture, is a kind of CPU where, although it may have several registers, the CPU mostly stores the results of calculations in one special register, typically called "the accumulator". Historically almost all early computers were accumulator machines; and many microcontrollers still popular as of 2010 (such as the68HC12, the PICmicro, the 8051 and several others) are basically accumulator

stack pointers-A stack pointer is a small register that stores the address of the last program request in astack. A stack is a specialized buffer which stores data from the top down. As new requests come in, they "push down" the older ones. The most recently entered request always resides at the top of the stack, and the program always takes requests from the top.

A stack (also called a pushdown stack) operates in a last-in/first-out sense. When a new data item is entered or "pushed" onto the top of a stack, the stack pointer increments to the next physical memory address, and the new item is copied to that address. When a data item is "pulled" or "popped" from the top of a stack, the item is copied from the address of the stack pointer, and the stack pointer decrements to the next available item at the top of the stack.

floating point- In computing, floating point describes a method of representing an approximation to real numbers in a way that can support a wide range of values. The numbers are, in general, represented approximately to a fixed number of significant digits (the mantissa) and scaled using an exponent. The base for the scaling is normally 2, 10 or 16. The typical number that can be represented exactly is of the form:

Significant digits × baseexponent

The idea of floating-point representation over intrinsically integer fixed-point numbers, which consist purely of significand, is that expanding it with the exponent component achieves greater range. For instance, to represent large values, e.g. distances between galaxies, there is no need to keep all 39 decimal places down to femtometre-resolution, employed in particle physics. Assuming that the best resolution is in light years, only 9 most significant decimal digits matter whereas 30 others bear pure noise and, thus, can be safely dropped. This is 100-bit saving in storage. Instead of these 100 bits, much fewer are used to represent the scale (the exponent), e.g. 8 bits or 2 decimal digits. Now, one number can encode the astronomic and subatomic distances with the same 9 digits of accuracy. But, because 9 digits are 100 times less accurate than 9+2 digits reserved for scale, this is considered as precision-for-range trade-off. The example also explains that using scaling to extend the dynamic range results in another contrast with usual fixed-point numbers: their values are not uniformly spaced. Small values, the ones close to zero, can be represented with much higher resolution (1 femtometre) than distant ones because greater scale (light years) must be selected for encoding significantly larger values.[1] That is, floating-point cannot represent point coordinates with atomic accuracy in the other galaxy, only close to the origin.

The term floating point refers to the fact that their radix point (decimal point, or, more commonly in computers, binary point) can "float"; that is, it can be placed anywhere relative to the significant digits of the number. This position is indicated as the exponent component in the internal representation, and floating-point can thus be thought of as a computer realization of scientific notation. Over the years, a variety of floating-point representations have been used in computers. However, since the 1990s, the most commonly encountered representation is that defined by the IEEE 754 Standard.

The speed of floating-point operations, commonly referred to in performance measurements as FLOPS, is an important machine characteristic, especially in software that performs large-scale mathematical calculations.

status information and buffer registers.- A buffer register is the simplest kind of register; all it does is store a digital information temporarily. It holds the contents of the memory which are to be transferred from memory to other components. By acting as a buffer, it allows the central processor and memory units to operate independently without being affected by minor differences in operation.

Addressing Mode:-The term ***addressing modes*** refers to the way in which the operand of an instruction is specified. Information contained in the instruction code is the value of the operand or the address of the result/operand. Following are the main addressing modes that are used on various platforms and architectures.

1) Immediate Mode

The operand is an immediate value is stored explicitly in the instruction:

Example: SPIM (opcodedest, source)

li $11, 3 // loads the immediate value of 3 into register $11

li $9, 8 // loads the immediate value of 8 into register $9

Example : (textbook uses instructions type like, opcode source, dest)

move #200, R0; // move immediate value 200 in register R0

2) Index Mode

The address of the operand is obtained by adding to the contents of the general register (called index register) a constant value. The number of the index register and the constant value are included in the instruction code. Index Mode is used to access an array whose elements are in successive memory locations. The content of the instruction code, represents the starting address of the array and the value of the index register, and the index value of the current element. By incrementing or decrementing index register different element of the array can be accessed.

Example: SPIM/SAL - Accessing Arrays

```
.data
array1: .byte 1,2,3,4,5,6
.text
__start:
move $3, $0             # $3 initialize index register with 0
add $3, $3,4            # compute the index value of the fifth element
sb $0, array1($3)       # array1[4]=0
                        # store byte 0 in the fifth element of the array
                        # index addressing mode
done
```

3) Indirect Mode

The effective address of the operand is the contents of a register or main memory location, location whose address appears in the instruction. Indirection is noted by placing the name of the register or the memory address given in the instruction in parentheses. The register or memory location that contains the address of the operand is a pointer. When an execution takes place in such mode, instruction may be told to go to a specific address. Once it's there, instead of finding an operand, it finds an address where the operand is located.

NOTE:

Two memory accesses are required in order to obtain the value of the operand (fetch operand address and fetch operand value).

Example: (textbook) ADD (A), R0

(address A is embedded in the instruction code and (A) is the operand address = pointer variable)

Example: SPIM - simulating pointers and indirect register addressing

The following "C" code:

```
int *alpha=0x00002004, q=5;
*alpha = q;
```

could be translated into the following assembly code:

```
alpha: .word 0x00002004 # alpha is and address variable # address value is 0x00002004
q: .word 5
....
lw $10,q            # load word value from address q in into $10
                    # $10 is 5
```

```
lw $11,alpha        # $11 gets the value 0x0002004
                    # this is similar with a load immediate address value
sw $10,($11)        # store value from register $10 at memory location
                    # whose address is given by the contents of register $11
                    # (store 5 at address 0x00002004)
```

Example: SPIM/SAL - - array pointers and indirect register addressing

```
.data
array1: .byte 1,2,3,4,5,6
.text
__start:
la $3, array1       # array1 is direct addressing mode
add $3, $3,4        # compute the address of the fifth element
sb $0, ($3)         # array1[4]=0 , byte accessing
                    # indirect addressing mode
done
```

4) Absolute (Direct) Mode

The address of the operand is embedded in the instruction code.

Example: (SPIM)

```
beta: .word 2000

lw $11, beta        # load word (32 -bit quantity) at address beta into register $11
                    # address of the word is embedded in the instruction code
                    # (register $11 will receive value 2000)
```

5) Register Mode

The name (the number) of the CPU register is embedded in the instruction. The register contains the value of the operand. The number of bits used to specify the register depends on the total number of registers from the processor set.

Example (SPIM)

```
add $14,$14,$13     # add contents of register $13 plus contents of
                    # register $14 and save the result in register $14
```

No memory access is required for the operand specified in register mode.

6) Displacement Mode

Similar to index mode, except instead of a index register a base register will be used. Base register contains a pointer to a memory location. An integer (constant) is also referred to as a displacement. The address of the operand is obtained by adding the contents of the base register plus the constant. The difference between index mode and displacement mode is in the number of bits used to represent the constant. When the constant is represented a number of bits to access the memory, then we have index mode. Index mode is more appropriate for array accessing; displacement mode is more appropriate for structure (records) accessing.

Example: SPIM/SAL - Accessing fields in structures

```
.data
student: .word 10000 #field code
.ascii "Smith" #field name
.byte # field test
.byte 80,80,90,100 # fields hw1,hw2,hw3,hw4
.text
__start:
la $3, student      # load address of the structure in $3
                    # $3 base register
add $17,$0,90       # value 90 in register $17
                    # displacement of field "test" is 9 bytes
                    #
sb $17, 9($3)       # store contents of register $17 in field "test"
                    # displacement addressing mode
done
```

7) Autoincrement /Autodecrement Mode

A special case of indirect register mode. The register whose number is included in the instruction code, contains the address of the operand. Autoincrement Mode = after operand addressing , the contents of the register is incremented. Decrement Mode = before operand addressing, the contents of the register is decrement.

Example: SPIM/SAL - - simulating autoincrement/autodecrement addressing mode

(**MIPS** has no autoincrement/autodecrement mode)

```
lw $3, array1($17)       #load in reg. $3 word at address array1($17)
addi $17,$17,4           #increment address (32-bit words) after accessing
                           #operand this can be re-written in a "autoincrement like
mode":
lw+ $3,array1($17)         # lw+ is not a real MIPS instruction
```

```
subi $17,$17,4        # decrement address before accessing the operand
lw $3,array1($17)
```

NOTE: the above sequence can be re-rewritten proposing an "autodecrement instruction", **not real** in MIPS architecture.

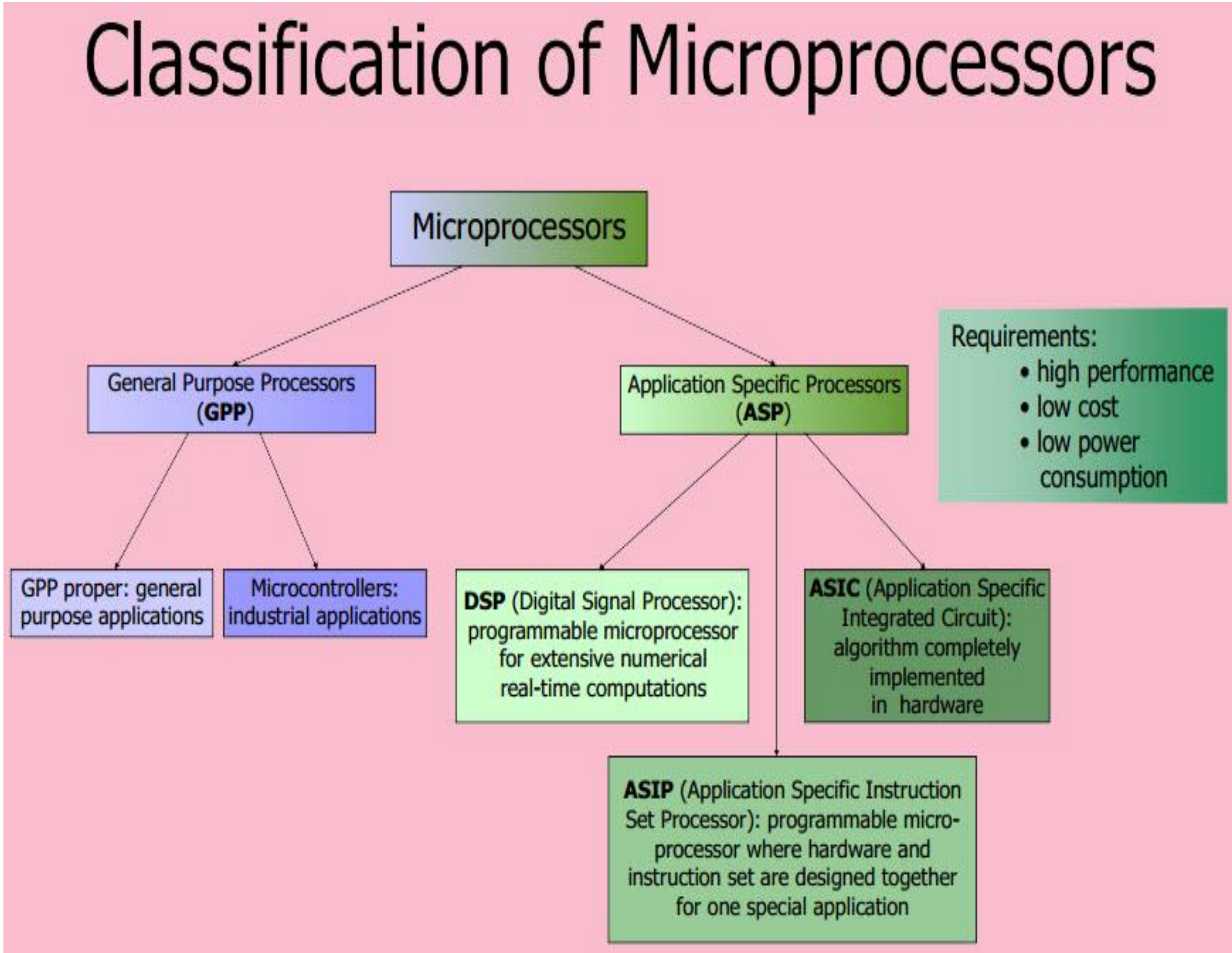
```
-lw $3, array1($17)
```

Q5 (a)What is Microprocessor? Define it's different types.

Ans-5 (a)The microprocessor is nothing but the CPU and it is an essential component of the computer. It is a silicon chip that comprises millions of transistors and other electronic components that process millions of instructions per second. A Microprocessor is a versatile chip, that is combined with memory and special purpose chips and preprogrammed by a software. It accepts digital data as i/p and processes it according to the instructions stored in the memory.The microprocessor has many functions like functions of data storage, interact with various other devices and other time related functions. But, the main function is to send and receive the data to make the function of the computer well. This article discusses about the types and evolution of microprocessor.The first generation microprocessors were introduced in the year 1971-1972. The instructions of these microprocessors were processed serially, they fetched the instruction, decoded and then executed it. When an instruction of the microprocessor was finished, then the microprocessor updates the instruction pointer & fetched the following instruction, performing this consecutive operation for each instruction in turn..The second generation of the microprocessor is defined by overlapped fetch, decode and execute the steps. When the first generation is processed in the execution unit, then the second instruction is decoded and the third instruction is fetched.

Types of Microprocessor:-

Microprocessors are classified into five types, namely: CISC-Complex Instruction Set Microprocessors, RISC-Reduced Instruction Set Microprocessor, ASIC- Application Specific Integrated Circuit, Superscalar Processors, DSP's-Digital Signal Microprocessors.



Complex Instruction Set Microprocessors

The short term of Complex Instruction Set Microprocessors is CISM and they classify a microprocessor in which orders can be performed together along with other low level activities. These types of processors performs the different tasks like downloading, uploading, recalling data into the memory card and recalling data from the memory card. Apart from these tasks, it also does complex mathematical calculations in a single command.

Reduced Instruction Set Microprocessor

The short term of Reduced Instruction Set Microprocessor is RISC. These types of processors are made according to the function in which the microprocessor can carry out small things in specific command. In this way these processors completes more commands at a faster rate.

Superscalar Microprocessors

Superscalar processor facsimiles the hardware on the processor to perform various tasks at a time. These processors can be used for ALUs or multipliers. They have different operational units and these processors can carry out more than a one command by continuously transmitting several instructions to the extra operational units inside the processor.

Digital Signal Multiprocessors

Digital signal processors are also called as DSP's, these processors are used to encode and decode the videos or to convert the D/A (digital to analog) &A/D (analog to digital). They need a microprocessor that is excellent in mathematical calculations. The chips of this processor are employed in RADAR, home theaters, SONAR, audio gears, TV set top boxes and Mobile phones

There are many companies like Intel, Motorola, DEC (Digital Equipment Corporation), TI (Texas Instruments) associated with many microprocessors such as 8085 microprocessors, ASIC, CISM, RISC, DSPs and 8086 microprocessors like Intel

(b)What is CISC and RISC? Explain it's difference also.

Ans:-CISC:-**CISC** has the ability to execute addressing modes or multi-step operations within one instruction set. It is the design of the **CPU** where one instruction performs many low-level operations.The term "CISC" (complex instruction set computer or computing) refers to computers designed with a full set of computer instructions that were intended to provide needed capabilities in the most efficient way. Later, it was discovered that, by reducing the full set to only the most frequently used instructions, the computer would get more work done in a shorter amount of time for most applications. Since this was called reduced instruction set computing (RISC), there was now a need to have something to call full-set instruction computers - thus, the term CISC

RISC:-RISC (reduced instruction set computer) is a microprocessor that is designed to perform a smaller number of types of computer instructions so that it can operate at a higher speed (perform more millions of instructions per second, or MIPS). Since each instruction type that a computer must perform requires additional transistors and circuitry, a larger list or set of computer instructions tends to make the microprocessor more complicated and slower in operation.

Difference Between CISC and RISC:-

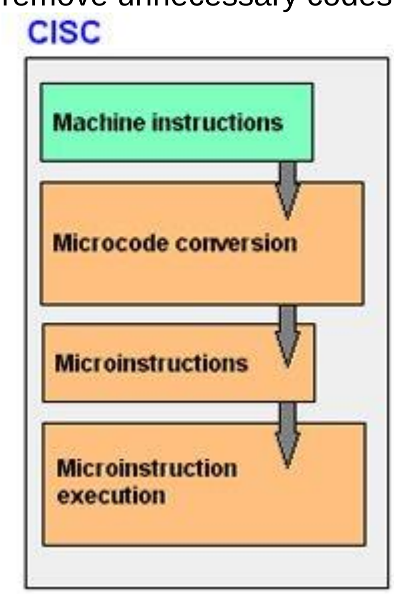
The main difference between RISC and CISC is in the number of computing cycles each of their instructions take. The difference the number of cycles is based on the complexity and the goal of their instructions.

The term RISC stands for 'Reduced Instruction Set Computer'. It is a CPU design strategy based on simple instructions and fast performance.

RISC is small or reduced set of instructions. Here, each instruction is meant to achieve very small tasks. In a RISC machine, the instruction sets are simple and basic, which help in composing more complex instructions. Each instruction is of the same length; the instructions are strung together to get complex tasks done in a single operation. Most instructions are completed in one machine cycle. This pipelining is a key technique used to speed up RISC machines.

RISC is a microprocessor that is designed to carry out few instructions at the same time. Based on small instructions, these chips require fewer transistors, which make the transistors cheaper to design and produce. Some other features of RISC include:

- Less decoding demand
- Uniform instruction set
- Identical general purpose register
- Simple addressing nodes
- Few data types in hardware
  - Also, while writing codes, RISC makes it easier by allowing the programmer to remove unnecessary codes and prevents wasting of cycles.



  -
  - The term CISC stands for 'Complex Instruction Set Computer'. It is a CPU design strategy based on single instructions, which are capable of performing multi-step operations.
  - CISC computers have shorted programs. It has a large number of complex instructions, which takes long time to execute. Here, a single set of instruction is covered in multiple steps; each instruction set has more than three hundred

separate instructions. Most instructions are completed in two to ten machine cycles. In CISC, instruction pipelining is not easily implemented.

- The CISC machines have good performances, based on the simplification of program compilers; as the range of advanced instructions are easily available in one instruction set. They design complex instructions in one simple set of instructions. They perform low level operations such as an arithmetic operation, or a load from memory and memory store. CISC makes it easier to have large addressing nodes and more data types in the machine hardware. However, CISC is considered less efficient than RISC, because of it inefficiency to remove codes which leads to wasting of cycles. Also, microprocessor chips are difficult to understand and program for, because of the complexity of the hardware.
- Comparison between RISC and CISC:

	RISC	**CISC**
Acronym	It stands for 'Reduced Instruction Set Computer'.	It stands for 'Complex Instruction Set Computer'.
Definition	The RISC processors have a smaller set of instructions with few addressing nodes.	The CISC processors have a larger set of instructions with many addressing nodes.
Memory unit	It has no memory unit and uses a separate hardware to implement instructions.	It has a memory unit to implement complex instructions.
Program	It has a hard-wired unit of programming.	It has a micro-programming unit.
Design	It is a complex complier design.	It is an easy complier design.
Calculations	The calculations are faster and precise.	The calculations are slow and precise.
Decoding	Decoding of instructions is simple.	Decoding of instructions is complex.

Time	Execution time is very less.	Execution time is very high.
External memory	It does not require external memory for calculations.	It requires external memory for calculations.
Pipelining	Pipelining does function correctly.	Pipelining does not function correctly.
Stalling	Stalling is mostly reduced in processors.	The processors often stall.
Code expansion	Code expansion can be a problem.	Code expansion is not a problem.
Disc space	The space is saved.	The space is wasted.
Applications	Used in high end applications such as video processing, telecommunications and image processing.	Used in low end applications such as security systems, home automations, etc.