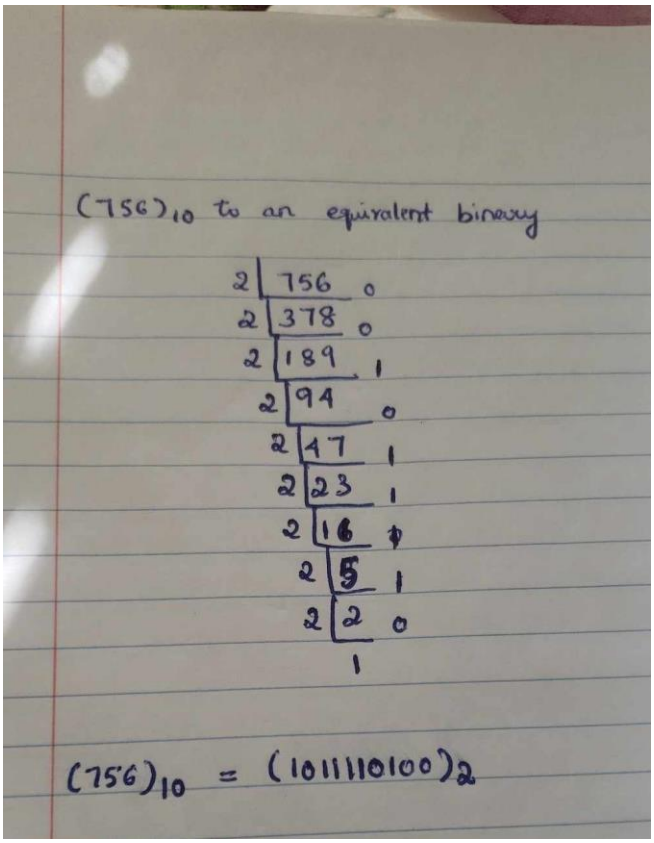
BCS-011 : COMPUTER BASICS AND PC SOFTWARE

December 2021

1. (a) Convert the following numbers as asked : 5

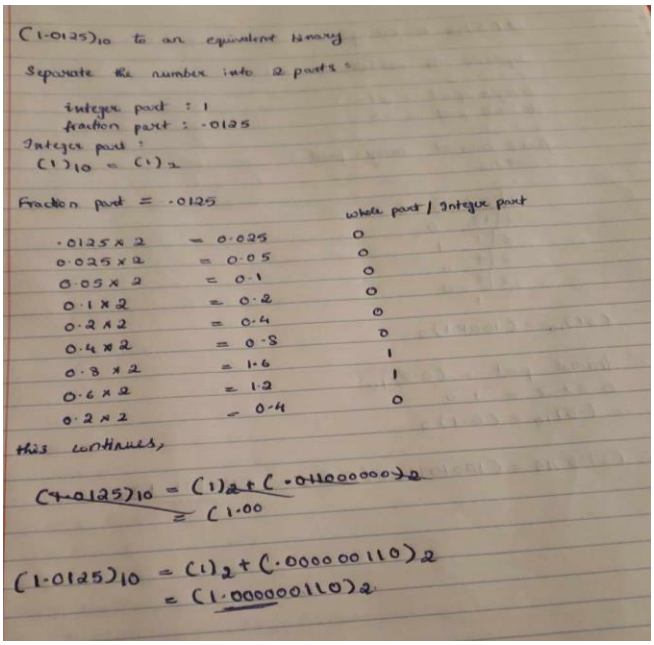
(i) Convert $(756)_{10}$ to an equivalent binary.

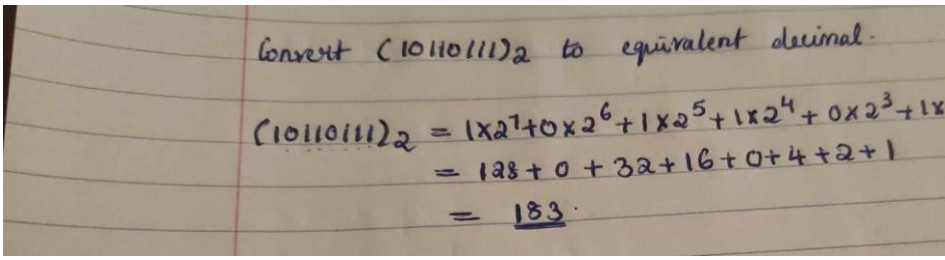
Ans:



(ii) Convert $(1.0125)_{10}$ to an equivalent binary.

Ans:





(iv) Convert (1011111111100111) $_2$ to an equivalent hexadecimal.

Ans: (1011111111100111) $_2$ = 1011 1111 1110 0111

= B F E 7

= $(BFE7)_{16}$

v) Convert (49AF) $_{16}$ to an equivalent binary

Ans: $(49AF)_{16}$ = 0100 1001 1010 1111

=$(0100100110101111)_{16}$

(b) Explain how the storage capacity and density of a disk can be calculated. A disk pack having a diameter of 3.0 inches has 5 plates (10 recording surfaces). It has 5000 tracks per surface with 128 sectors per track. Assuming that each sector can store 1 kB of data, calculate the storage capacity and storage density of the disk. 5

Ans:

Suppose a HDD (or disk pack) having n plates, has:

m=2n= total number of recording surfaces

t= tracks per surface

p= Sectors per track

s=bytes per sector,

π=3.14

then

Storage capacity of the disk=(m*t*p*s) bytes

If d is the diameter of the disk, the density of the recording is: Density=(s*p)/(π*d) byte/inches

m=2n=10

t=5000

p=128

s=1kB

Storage capacity of the disk=(10*5000*128*1)

= 6400000kB

Storage capacity in MB=6400000/1024 (1MB=1024kB)

= 6250MB

Density of the disk=(s*p)/(π*d) byte/inches

=(1*128)/(3.14*3))

=(128)/(9.42)

=13.58kB/inches

(c) Compare and contrast the following : 4

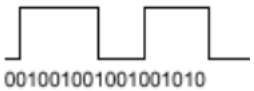
(i) Impact printers and non-impact printers

Ans:

Impact printers	Non-impact printers
Impact printers create pictures and figures by hitting a device such as a wheel or a print hammer against an inked ribbon.	A non-Impact printer uses chemical, heat or electrical signals to produce symbols on paper.
They produce high level noise as they have many moving parts.	They have a low level of noise.
The print quality of such printers is lower.	The print quality of non-impact printers is higher.
They require continuous paper sheets for printing.	They require individual sheets of paper for printing.
Dot-matrix printers, daisy wheel printers, line printers are examples.	Inkjet printers, photo printers, laser printers are examples.
They are not suitable for printing photographs or any high-quality media.	They are best suited for printing photographs or any high-quality media.

(ii) Analog monitor and digital monitor

Ans:

Analog Monitor	Digital Monitor
The Electronic signal that is sent by signals of varying frequency, amplitude or phase instead of being sent as an ON or OFF data transmission is called an analog signal.	An electronic signal that is sent as binary digits of either ON or OFF is called a Digital signal.
Analog monitors use continuous signals.	Digital monitors process information in discrete binary code.
Examples of analog displays are traditional watches and clocks, weighing scales etc.	Examples of digital displays are calculators.
	

(d) You bought a raw computer from the market. It has only the hardware and device drivers loaded in it. Which software is essentially to be loaded into this raw computer to make it usable ? Explain any four functions of this software. 5

Ans: To make a raw computer useable, the essential software that needs to be loaded is called an Operating System. The operating system acts as an intermediary between the

user and the computer hardware, enabling users to execute commands and run applications.

Five facilities that are provided by an operating system to a user or to a program are:

• Command processor and user interface

• File management system

• Input/output control system

• Process management

• Memory management

1. Command processor and user interface:

To the user, the most important and visible services provided by the OS is the user interface and the capabilities that it provides to execute commands which may not be a part of OS.

These systems consider the user interface as a separate shell that is Operating Sytem provided with the operating system and that interacts with the kernel to provide the necessary-user command capabilities. In UNIX, three different shells, the C shell, the Bourne shell, and the Korn shell are in common use, and many other shells for UNIX are available. Each of these shells provides different command structures and different capabilities.

Different types of user interface exist. The most common are the graphical user interface, or GUI, and the command line interface. The graphical user interface accepts commands primarily in the form of drop-down menus, mouse movements, and mouse clicks. The command line interface relies on typed commands which provide direct access to various methods within operating system such as File system, I/O system, and network services. UNIX allows certain class of users called superusers to use some kind of commands for changing the platform or access rights.

2.File Management:

The concept of a file is central to the effective use of a computer system. A file is generally loosely defined as a collection of related information such as students records employee database. It might contain graphical usage. A file may be organized internally into records or it may simply be a stream of bytes. A file constitutes a logical unit of storage, that is, logical to the person or program using the file.

The file management system provides and maintains the mapping between a file logical storage needs and the physical location where it is stored. Users and programs simply access the files by the name, and the file management system handles the details The file management system identifies and manipulates files by the names provided by their users determines the physical requirements of the file, allocate space for it, stores it in that space, and maintains the information about the file so that it may be retrieved partially or in full, later. The file management system keeps track of the available space on each device connected to the system. The user and the user's program need not be aware of the underlying physical storage issues.

The file management system allows the retrieval and storage of files by name, keeps track of the mappings, allocates and frees space, allows the mounting and unmounting of file structures, and provides other functions required to maintain the structures of the file system.

Directory structures for each I/O device in the system and tools to access and move around these structures. The directory structure provisions are made to move easily from one structure to another.

It also protects files and limit file access to authorized users.

File management systems are particularly important in systems in which secondary storage devices are shared in common by multiple users, since they provide a directory system that assures that there is no duplicate use of physical storage.

3.Input/Output Services:

Every operating system, large or small, provides input/output services for each device in the system. The operating system includes I/O device driver programs for each device installed on the system. These drivers provide services to the file management system and are also available, through the API, to other programs for their use. The I/O device drivers accept I/O requests and perform the actual data transfers between the hardware and specified areas of memory. Devices drivers for newly installed devices are added and integrated into the operating systems. In Windows, this capability is known as plug-and-play.

4. Memory Management: The purpose of the memory management system is to load programs into memory in such a way as to give each program loaded the memory that it requires for execution.

In multiprogramming operating system there are many programs residing in the Operating System memory simultaneously in the memory.

The memory management system has three primary tasks. It attempts to perform these tasks in a way that is fair and efficient to the programs that must be loaded and executed.

1. It keeps track of which parts of the memory are currently being used and by which process into memory together with the space being used and also keeps track of available space.

2. It maintains one or more queues of programs waiting to be loaded into memory as space becomes available, based on such program criteria as priority and memory requirements.

3. When space is available, it allocates memory to the programs that are next to be loaded. It also de-allocates a program's memory space when it completes execution. The deallocated space is made available for other programs.

(e) While using a programming language, you are required to process the following tabular data : 4

		Column		
		1	2	3
Row	1	25	30	15
	2	5	7	90
	3	5	9	20

(i) Which programming element will be used by you to process the table as given above ?

(ii) What will be the data type of each element ?

(iii) Which statement will be useful for repeat the processing task for the data above ?

(i) Which programming element will be used by you to process the table as given above ?

Ans: Arrays can be used to process the table as given above.

(ii) What will be the data type of each element ?

Ans: The data type of each element in the above table is integer (int).

(iii) Which statement will be useful for repeat the processing task for the data above ?

Ans: For loop : This is useful when you know how many times we want to iterate.

(f) Given the value of a = 7 and b = 9, what will be the value of the following ? 4

(i) b% a;

(ii) b++;

(iii) a > b

(iv) a < b || b < a

(i) b% a;

Ans: The modulus operator (%) gives the remainder of the division of b by a.

9%7=2

(ii) b++;

Ans: The increment operator increases the value of b by 1. However, the expression b++ returns the original value of b before the increment.

Therefore b=9.

(iii) a > b

Ans: This operator checks if a is greater than b.

7>9

False

(iv) a < b || b < a

Ans: This operator is logical OR operator.

First, we find

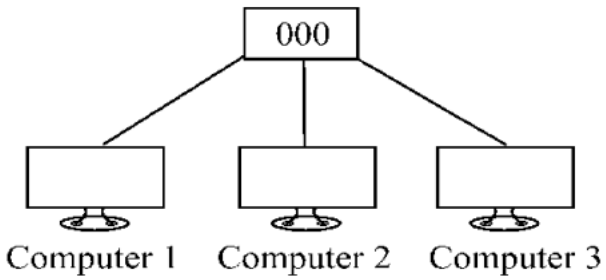
a<b = True

Next, we find b<a

b<a =False

True||False= True

(g) Identify the network topology shown in the following figure : 5



Explain the advantages and disadvantages of this topology.

Ans: The topology in the above figure is star topology.

Star topology is a LAN topology in which all the nodes are individually connected to a central connection point called hub (also known as concentrator). When any node wants to transmit data to another node it first transmits data to the hub that re-sends the message either to all the computers or only to the destination computer.

A hub expands one network connection into many. A single hub is sufficient for a small network; however large networks require multiple hubs. But it increases hardware and cabling costs.

Advantages:

a) It is very reliable- if one cable or device fails, it does not affect others.

b) It is easy to replace, install or remove hosts or other devices, problem can be easily detected.

c) It is high-performing as no data collisions can occur.

Disadvantages:

a) It is expensive to install as it requires more cable, it costs more to cable a star network because all network cables must be pulled to one central point, requiring more cable length than other networking topologies.

b) Central node dependency, if central hub fails, the whole network fails to operate.

c) Many star networks require a device at the central point to rebroadcast or switch the network traffic.

(h) Given the following IP addresses and subnet masks. Identify the valid IP addresses and find Net_id for those IP addresses using subnet masks : 4

IP address	Subnet mask
(i) 10.251.250.256	255.255.255.0
(ii) 172.16.20.5	255.240.0.0
(iii) 192.168.89.25	255.255.0.0
(iv) 192.168.75.25	255.255.255.0

Ans:

(i) 10.251.250.256 and subnet mask 255.255.255.0 To determine whether the given IP address “10.251.250.256” is valid, we need to check the format and range of the values in each of its segments. An IP address in IPV4 format consists of four numerical segments known as octets, separated by periods. Each octet must be a number from 0 to 255, inclusive.

Let’s break down the IP address and verify each octet:

The first octet 10, is within the range of 0 to 255.

The second octet 251, is within the range of 0 to 255.

The third octet 250, is within the range of 0 to 255.

The fourth octet 256, is not within the range of 0 to 255.

Therefore, the above address is an invalid address.

(ii) 172.16.20.5 and subnet mask 255.240.0.0

Ans: The first octet 172, is within the range of 0 to 255.

The second octet 16, is within the range of 0 to 255.

The third octet 20, is within the range of 0 to 255.

The fourth octet 5, is within the range of 0 to 255.

Therefore, the above address is a valid address.

Net_id:

IP Address in binary: 10101100.00010000.00010100.00000101

Subnet mask in binary: 11111111.11110000.00000000.00000000

Network ID: Bitwise AND of both

10101100.00010000.00010100.00000101

11111111.11110000.00000000.00000000

Net_ID: 10101100.00010000.00000000.00000000

Net_id: 172.16.0.0

(iii) 192.168.89.25 subnet mask 255.255.0.0

Ans: The first octet 192, is within the range of 0 to 255.

The second octet 168, is within the range of 0 to 255.

The third octet 89, is within the range of 0 to 255.

The fourth octet 25, is within the range of 0 to 255.

Therefore, the above address is a valid address.

Net_id:

IP Address in binary: 11000000. 10101000. 1011001. 00011001 Subnet mask in binary: 11111111. 11111111.00000000.00000000

Network ID: Bitwise AND of both

11000000. 10101000. 1011001. 00011001

11111111. 11111111.00000000.00000000

Net_ID: 11000000.10101000.00000000.00000000

Net_id: 192.168.0.0

(iv) 192.168.75.25 subnet mask: 255.255.255.0

Ans:

Ans: The first octet 192, is within the range of 0 to 255.

The second octet 168, is within the range of 0 to 255.

The third octet 75, is within the range of 0 to 255.

The fourth octet 25, is within the range of 0 to 255.

Therefore, the above address is a valid address.

Net_id:

IP Address in binary: 11000000. 10101000. 01001011. 00011001

Subnet mask in binary: 11111111. 11111111.11111111.00000000

Network ID: Bitwise AND of both

11000000. 10101000. 01001011. 00011001

11111111. 11111111.11111111.00000000

Net_ID: 11000000.10101000.01001011.00000000

Net_id: 192.168.75.0

(i) What is the need of a browser software ? List the names of 4-ineractions/buttons that should be present in a browser. Also list the names of two popular browsers.

Ans:

Need for a web browser:

A Web browser is a software application that enables you to find, retrieve, and display information available on the World Wide Web (WWW). A web browser takes you anywhere on the internet. It retrieves information from other parts of the web and displays it on your desktop or mobile device. It provides an interface between the server and the client and it requests to the server for web documents and services. Browser also allows you to traverse information resources on the WWW. A web browser converts the HTML tags and their content into a formatted display of information. The information on the Web is organized and formatted using tags of a Markup language called Hypertext Markup Language or HTML. A web browser allows you to see the rich web contents from a website.

• Back/Forward Buttons: Back button can be used by you for going back to the previously visited web page whereas the Forward button is used to visit the next page.

• Tab: It allows you to view multiple web pages in the same browser without opening a new browser session.

• Home: The first web page which loads when we open a browser is called the home page. Home button will bring you back to the home page of your website.

• Stop: It cancels loading of the current web page. This button is used when the page is in the loading state.

• Refresh button: This button is also known as reload button. This button reloads the page the current page and shows updates if any.

• History: This shows the links to the web pages previously visited by you. This feature is a very handy feature to revisit websites.

Popular web browser:

Some of the popular web browsers are - Internet Explorer, Mozilla Firefox, Apple Safari, Google Chrome, and Opera.

2.

(a) What is an instruction in a computer ? Explain with the help of an example. What are the different components of a CPU and what are their roles ? Which of these components interprets the instruction ? 7

Ans: An instruction is an order given to a computer processor by a computer program. The entire set of instructions that can be executed by the processor directly, through the logic in hardware, form the instruction set of the processor. An instruction tells the processor what task is to be performed and what micro-operations need to be completed to perform the task. The size and format of the instruction varies with different processors. Every instruction is comprised of two parts: opcode and operands. The opcode specifies the operation to be performed and the operands provide the data on which the operation is to be performed.

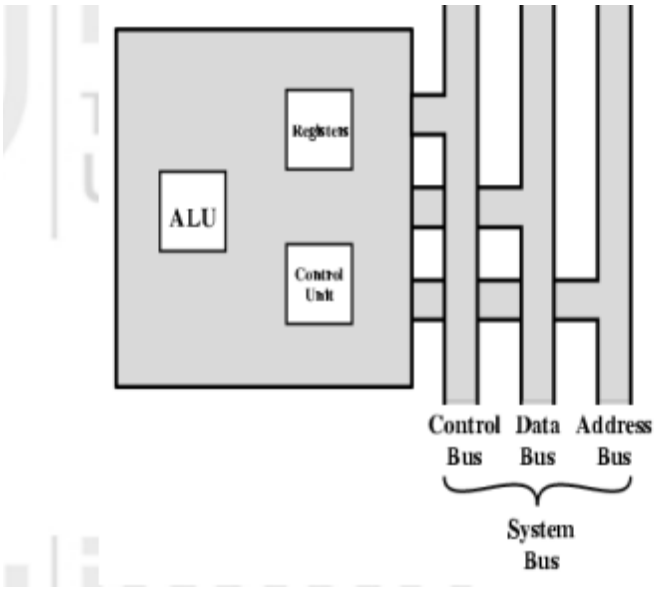
For example:

In the instruction, 0001001001100100101 the first three bits represent the opcode and the remaining sixteen bits represent the two operands each a two-digit decimal number expressed using BCD code. Thus, the instruction 0001001001100100101 represents 93 + 25.

Components of a CPU:

CPU contains Arithmetic Logic Unit (ALU) and Control Unit(CU). ALU and CU are jointly known as the central processing unit (CPU).

CPU has three major identifiable parts: Control Unit (CU), Arithmetic & logic Unit (ALU) and a set of Registers. The below figure presents the components of a computer:



Arithmetic Logic Unit(ALU) : The Arithmetic and Logic Unit is that part of the CPU that actually performs arithmetic and logical operations on data. It performs the basic arithmetic, logical operations specified by the instructions. Arithmetic operations includes addition, subtraction, multiplication, and division. Logical operations includes comparison, selection and merging of data. The CU, CPU registers and memory help in bringing the data into the ALU and then taking the results back.

Control Unit: - The CU controls the execution of instructions by decoding the instruction and generating micro-operations to be performed for executing that instruction. It controls the operation of other parts of the computer. Control Unit (CU) is the unit which manages and coordinates the entire operation of a computer system. It controls the operation of the other components of a computer system. The Control Unit of the processor is that unit which controls and coordinates the execution of instructions by the processor. It is responsible for defining and controlling the instruction cycle. In essence, it causes things to happen in the processor. It issues control signals external to the processor to cause data exchange with memory and I/O modules. It also issues control signals internal to the processor to move data between registers, to cause the ALU to perform a specified function, and to regulate other internal operations. It generates timing signals and initiates the Fetch cycle of instruction execution. When the instruction is fetched, it

generates the sequence of micro-operations which need to be executed in order to execute the instruction. CU also generates timing signals for executing set of micro-operations. There are three different ways in which CU can generate these micro-operations: through a hardwired logic, by reading a programmable Array (PLA) table or by reading a Programmable Read Only Memory (PROM).

Functions of CU:

* It controls transfer of data and instructions among other units of computer.

* It does not store or process data.

* It fetches the instructions from the memory, decodes them, and executes them.

CPU has a set of Registers which is used to store some data temporarily. Register lies above Cache and Main memory in memory hierarchy of the system. The registers in CPU perform two roles:

- User-visible registers: used to store temporary data items and other user accessible information useful for machine or assembly language programmers.
- Control & Status Registers: used by control unit to control and coordinate the operation of the processor.

The CPU chip is interfaced with other components of the computer through a system bus which has three sets wires forming Control Bus, Data Bus and Address Bus.

Interpretation of instructions:

The control unit interprets the instruction and determines the operation to be performed.

(b) List at least three features of each of the following software : 6

(i) Spreadsheet

(ii) Database

(i) Spreadsheet

Ans: Few features of spreadsheets are:

* Cells and Grinds: Spreadsheets are made up of cells organized in rows and columns. Each cell can hold data such as numbers, text, or formulas.

* Formulae and function: Spreadsheets allow users to perform calculations using formulas. Formulas can be simple addition or complex functions involving multiple cells. Spreadsheets come with built-in functions for SUM, AVERAGE and COUNT. These functions can automate data analysis and calculations. There are different categories of functions that can be incorporated in the sheets like Date & Time, Mathematical, Statistical, Logical, Text functions etc.

The different categories of functions are:

Date and Time:

MONTH - Converts a serial number to a month

NOW - Returns the serial number of the current date and time

Math and Statistical:

SUM – Adds its arguments

COUNTIF - Counts the number of cells within a range that meet the given criteria

Logical:

IF - Specifies a logical test to perform

AND - Returns TRUE if all of its arguments are TRUE

* Charts and Graphs: Spreadsheets have charting and graphing tools that allow users to create visual representations of data such as bar graphs, pie chart etc.

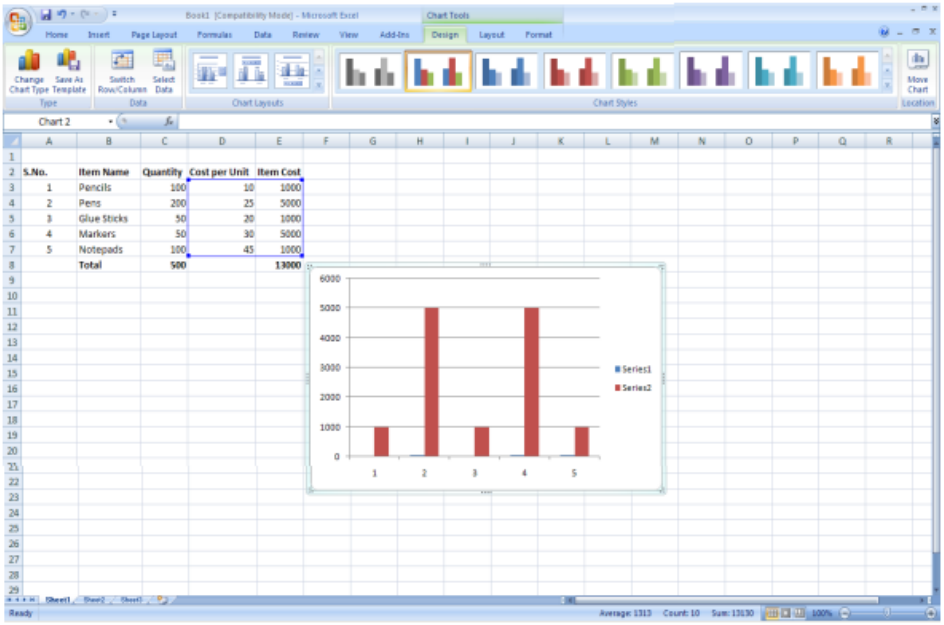
Charts and Graphs can be created based on data in the sheets. To create a chart to represent data graphically:

1. Select the data

2. Go to Insert

3. Select the chart type from the options available like Bar, Line, Pie, Scatter etc.

4. The chart will get automatically populated with the selected data on which the chart is to be based.



* Macros

A macro is a short program written using VBA that can be used to carry out a specific task. VBA is the language that Excel macros are written in. It is a programming language that is included with all of the Microsoft Office applications e.g. Word, Access, Power Point, Excel as well as others.

The Macro has to be recorded as follows:

1. Go to the Tools menu, go to —”macro” and then —”Record New Macro”

2. Assign a name to your macro if you'd like, as well as type a short description.

3. You can also assign a keyboard shortcut to it (so you can press a sequence of keys to run the macro).

4. Now click on OK. You'll be returned to Excel.

5. Simply perform the actions you want the macro to do.

6. Once you're done recording your macro, press the Stop button which should now be visible on your screen.

Once the Macro is recorded it can be executed in the following ways:

1. Run a macro by using the menu command

2. By pressing a CTRL combination shortcut key

3. Clicking a toolbar button or an area on an object, graphic, or control

4. Run a macro automatically when the workbook is opened.

(ii) Database

1. Table: A Table is a database object that is used to store data about a particular subject like employees, students or products. In a Table, the columns are called fields or attributes and the individual records are called Tuples (rows).

Creating table in database:

1. Click the Microsoft Office Button, and then click New.

2. In the File Name box, type a file name for the new database.

3. To browse to a different location to save the database, click the folder icon.

4. Click Create.

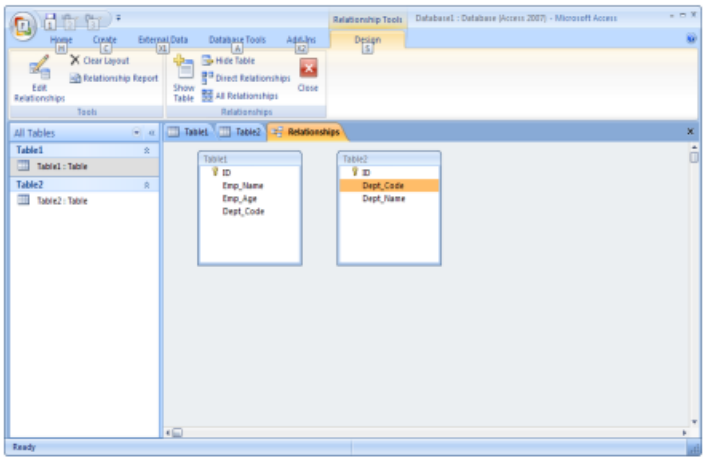
The new database opens, and a new table named Table1 is created and opens in Datasheet view.

2. Defining relationships: When you create a relationship between tables, the common fields are not required to have the same names, but the common fields must have the same data type. If the primary key field is an AutoNumber field, however, the foreign key field can also be a Number field if the FieldSize property of both fields is the same.

To create relationships between two tables,

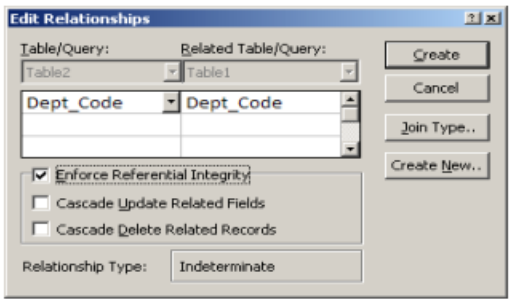
1. Choose Relationships under the Database Tools menu.

2. Then Choose the Table option and add the tables between which relationship has to be created.



3. Drag a field (typically the primary key) from one table to the common field (the foreign key) in the other table. To drag multiple fields, press the CTRL key, click each field, and then drag them.

4. The Edit Relationships dialog box appears as below:



5. To enforce referential integrity for this relationship, select the Enforce Referential Integrity check box.

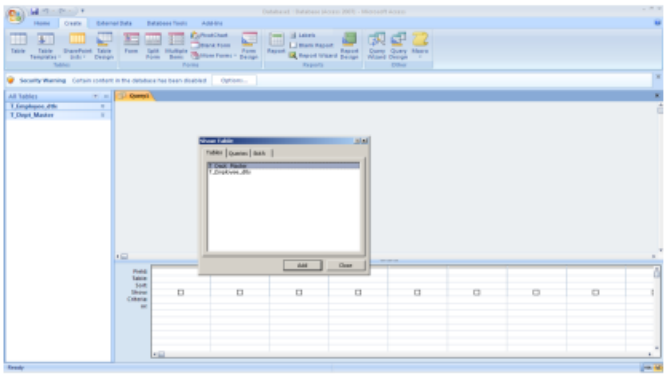
6. Click Create.

Access draws a relationship line between the two tables.

3. Defining queries: When data has to be reviewed, added, changed or deleted from the database, a query is used. Queries are also used to answer very specific questions about the data that would be difficult to answer directly by just looking at the table data. Queries can be used to perform calculations on the data, to filter data and to summarize the data.

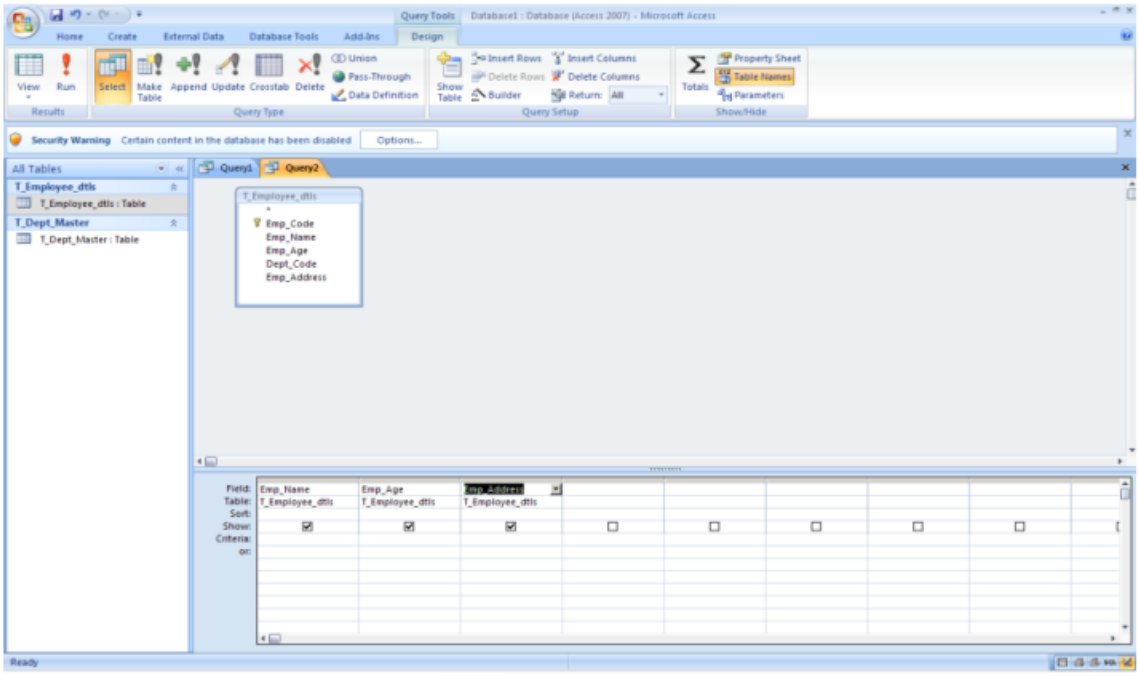
1. On the Create tab, in the query group, click query design. A show Table dialog box appears.

2. In the Show Table dialog box, choose the table on which query has to be based and close the show Table dialog box.

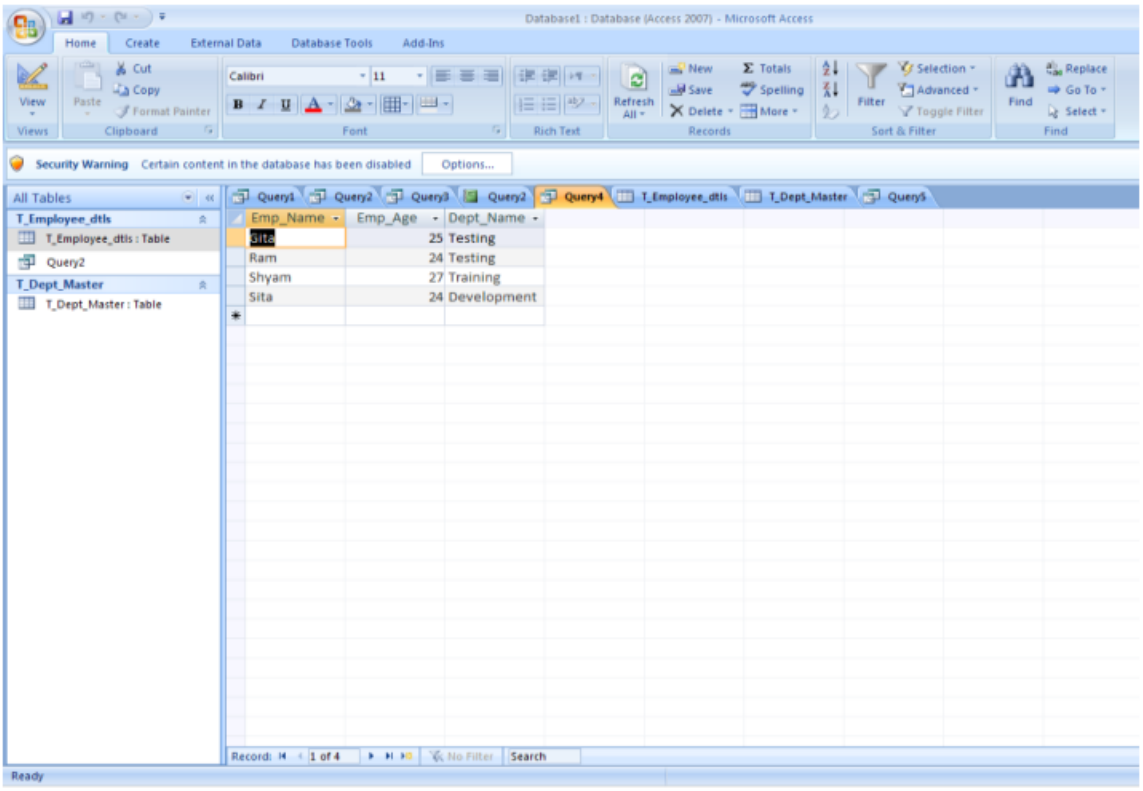


3. In the selected Table, double click the fields that have to be added to the query

4. On the Design Tab, in the Results group, click Run.



The query will be executed and the result is displayed in the grid as shown below



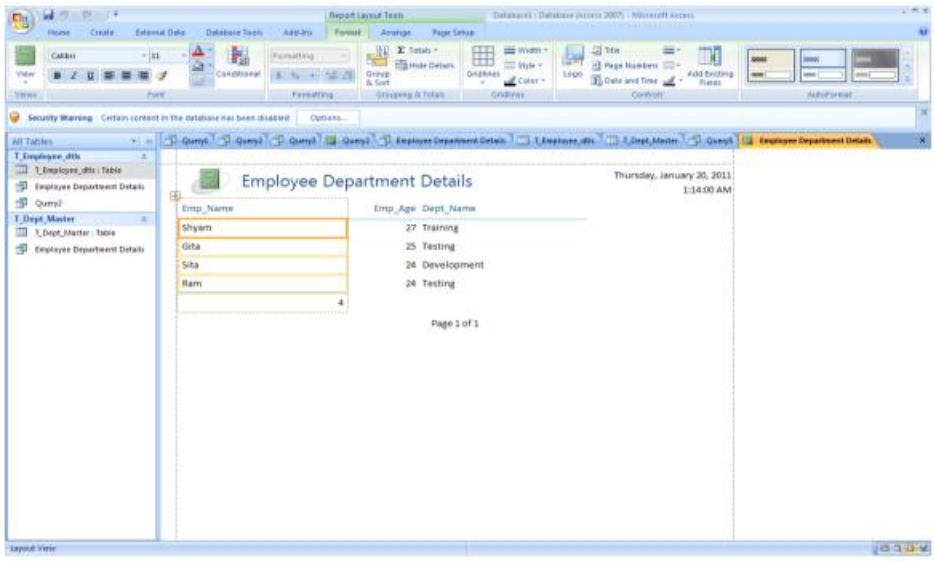
4. Report:

A Report consists of information from tables and queries that is stored with a particular report design such as labels, headings and graphics.

1. In the Navigation pane, select the query or Table on which the report has to be based.

2. On the Create Tab, in the Reports group, click Report

3. The Report will be created and displayed



Once the report is created, its layout can be modified in the Report design view.

(c) What is a LAN ? How is it different to WAN ? List the characteristics, advantages and disadvantages of LAN. 7

Ans: A local area network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A LAN can be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school.

Difference between LAN and WAN

LAN	WAN
It stands for Local Area Network.	It stands for Wide Area Network.
LAN's ownership is private.	Ownership can be private or public.
Speed of LAN is high ,upto 10-1Gbps.	Speed of WAN is slower than LAN, 256Kbps-2Mbps and beyond.
There is less congestion in LAN.	There is more congestion in WAN.
LAN (Local Area Network) is a computer network covering a small geographic area, like a home, office, school, or group of buildings.	WAN (Wide Area Network) is a computer network that covers a broad area (e.g., any network whose communications links cross metropolitan, regional, or national boundaries over a long distance).

Because it covers a relatively small geographical area, LAN is easier to maintain at relatively low costs.	Maintaining WAN is difficult because of its wider geographical coverage and higher maintenance costs.
LANs tend to have fewer problems associated with them, as there are smaller number of systems to deal with.	WANs tend to be less fault tolerant as they consist of large number of systems.
Experiences fewer data transmission errors.	Experiences more data transmission errors as compared to LAN
The network in an office building can be an example of LAN.	The internet is a good example of WAN.

Characteristics of LAN:

• It connects computers in a single building, block or campus, i.e. they work in a restricted geographical area.

• LANs are private networks, not subject to tariffs or other regulatory controls. For the Wireless LANs there are additional regulations in several countries.

• LANs operate at relatively high speed when compared to the typical WAN (.2 to 100 MB /sec).

• There are different types of Media Access Control methods in a LAN, the prominent ones are Bus based Ethernet, Token ring.

• LAN is a low-cost and effective network type capable of connecting multiple devices on a single transmission medium.

• Setting up a LAN network can be done at low costs. If there's a need for expansion, it can be done quickly.

Advantages of LAN:

• It allows sharing of expensive resources such as Laser printers, software and mass storage devices among a number of computers.

• It contributes to increased productivity. A LAN installation should be studied closely in the context of its proposed contribution to the long range interest of the organization.

• LAN allows for high-speed exchange of essential information

• It contributes to increased productivity. A LAN installation should be studied closely in the context of its proposed contribution to the long range interest of the organization.

• A LAN connection is relatively inexpensive to set up and maintain.

• The local nature of a LAN also makes troubleshooting quick and cost-effective.

• LAN is very adaptable. You can add or remove devices, move printers and computers to different areas of the building, and modify user information for existing devices with minimum hassle.

Disadvantages of LAN:

* LAN only covers a small geographical area like office, building, home etc.

* It requires a security system to protect confidential data.

* Setting up local area network is difficult.

* It is expensive to establish a LAN.

* LANs are limited in terms of the number of devices that can be connected to them. As the number of devices increases, the network can become slow and congested.

3.

(a) Write an algorithm and draw the flow- chart to find the sum of first n natural numbers. 7

Ans:

Step 1: Start

Step 2: Input number n

Step 3: Initialize sum=0

Step 4: Initialize i=1

Step 5: Compute sum=sum+i

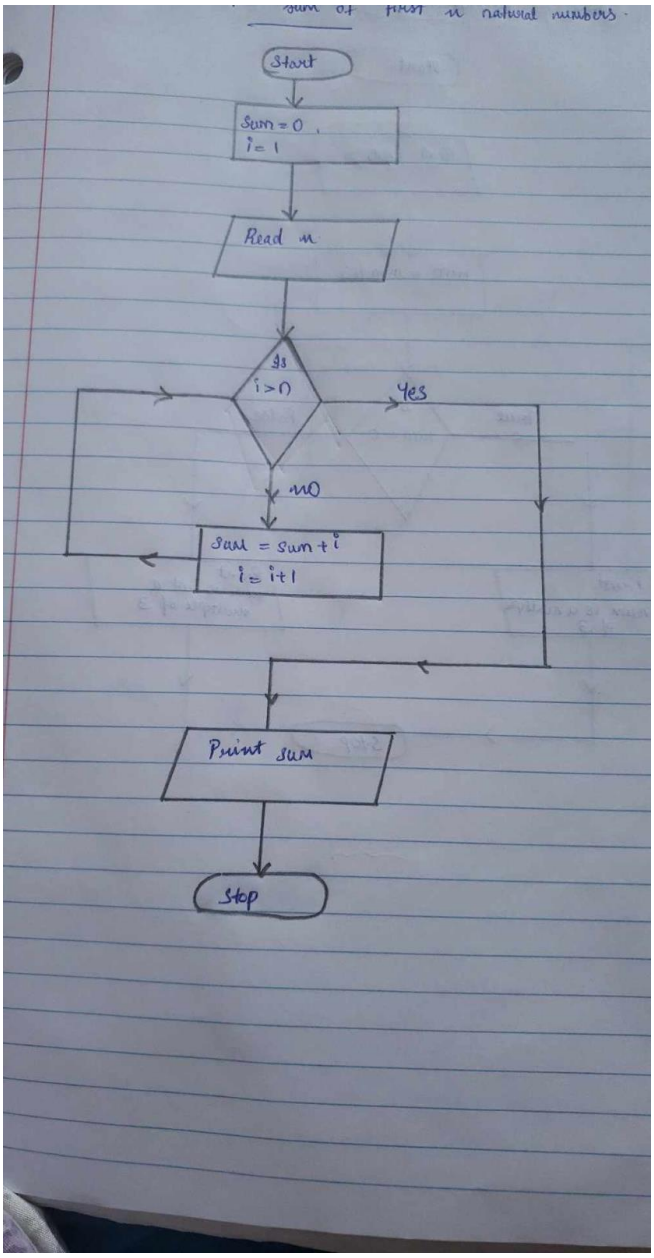
Step 6: Increment i by 1 i.e i=i+1

Step 7: check i <=n if yes go to step 5

Step 8: Print sum of first n natural numbers is , sum

Step 9: End

Flowchart:



(b) List any six activities that are a part of an e-learning software. Also list advantages and disadvantages of e-learning. 6

Ans:

Some of the activities that should be a part of an e-learning process:

• Login.

• Content access and assimilation.

• Undertake formative assessment online.

• formative assessment using assignments and discussions.

• Getting the feedback on formative assessment and working towards achieving learning outcomes.

• Communication with the students through various means like email, chat, SMS, and other means.

• Go through a summative assessment.

• Measuring the effectiveness of e-learning and performance assessment. • Recoding student achievements and certification.

Advantages of E-learning:

• Affordability: The cost of e-learning is one of its main advantages.

• It improves the IT skills of individuals and may improve their time management skills.

• Flexibility: Users are able to access educational content from anywhere with an internet connection. This means that students can continue their learning even if they are traveling or living in remote locations. The level of participation of student in learning may improve as it provides anytime, anywhere learning.

• Self-placed learning: E-learning gives students and workers the freedom to learn at their own pace, which can be useful for those who have varied learning preferences or have difficulty with a specific subject. Students can access educational materials and complete assignments via eLearning at their convenience and on their own timetable. Students can tailor their learning around their work and other responsibilities.

• It promotes active and independent learning.

• Through discussion boards and chats, one can interact with everyone online and also clear your doubts if any.

• The video instructions that are provided for audio and video learning can be rewound and seen and heard again and again if we do not happen to understand the topic.

Disadvantages of e-learning:

* The authenticity of a particular student's work is also a problem as online just about anyone can do a project rather than the actual student itself.

* The face-to-face learning experience is missing in e-learning. This can be a problem for those who learn better when they can work together with other students on the same subject.

* The interactive support that requires teacher at the other end may still be available in slotted time only. In traditional method, trainees can ask their trainers lots of questions and get immediate answers. On the other hand, in case of e-learning, the trainers usually work within their working hours and those trainees who learn out of these working hours may not be able to get an immediate response to their questions.

* E-learning requires reliable internet access and electronic devices which can be a challenge for some learners. When in a traditional training center, trainees can ask their trainers lots of questions and get immediate answers. However, in the case of e-learning, the trainers usually work within their working hours, and those trainees who learn out of these working hours may not be able to get an immediate response to their questions, and this may demotivate them.

* It allows possibilities of course material but that require constant support of a course team.

* While e-learning is flexible in place, it does require a level of motivation to complete and managers may need to monitor this.

(c) What is the purpose of use of main memory ? Explain the characteristics of RAM and ROM in this context. Also differentiate between SRAM and DRAM. 7

Ans: Purpose of main memory:

All modern computers use semiconductor memory as its main memory(primary memory). It is also known as Random Access Memory (RAM) because any part of the memory can be accessed for reading and writing. Any memory location can be accessed in a random manner for reading and writing. The access time is the same for each memory location. It usually refers to “temporary” memory, which means that when the system is shut down, the memory is lost.

It is really the main store and is the place where the program and software we load gets stored. When the CPU runs a program, it fetches the program instructions from the RAM and carries them out. Similarly, if the CPU needs to store the final results of calculations, it stores them in RAM. Thus, the CPU can both READ data from RAM and WRITE data into the RAM.

Main memory refers to physical memory that is internal to the computer. It is a computer's short-term storage. Main memory's job is to hold data that the CPU needs to access frequently, such as instructions and data currently being processed. Data can be accessed much more quickly than data stored on disk drives or other secondary storage devices. This in turn allows the CPU to quickly access and process the necessary information and improves the performance and speed of the computer. Primary memory is much faster and more expensive and has less storage capacity.

The computer can manipulate only data that is in the main memory. Hence, every program to execute and every file to be accessed must be copied from a storage device into the main memory. The amount of this space on a computer is crucial because it determines how many programs can be executed at one time and how much data can be readily available to a program.

Characteristics of RAM:

* The user can write information into RAM and read information from it.

* It is called random access since any memory location can be accessed in a random manner for reading and writing.

* RAM is a volatile memory, which means, it is present as long as the computer is in the ON state, as soon as the computer turns off, the memory is erased.

* RAM is known as the primary memory of the computer.

* RAM is known to be expensive.

* RAM is the fastest memory; therefore, it is an internal memory for the computer.

Characteristics of ROM:

- It is a non-volatile memory that is used to store important information which is used to operate the system.
- ROM is one in which information is stored permanently.
- ROM is much cheaper compared to RAMs.
- It is more reliable than RAM.

SRAM vs DRAM

Static RAM	Dynamic RAM
Static RAMs retain stored information only as long as the power supply is on.	It stores information as long as the power is supplied or a few milliseconds when the power is switched off.

Six (6) transistors are needed per memory cell in a static RAM.	Dynamic RAMs required fewer transistors per memory cell.
These are expensive.	These are cheaper.
Consumes less power.	Consumes more power.
SRAM is faster compared to DRAM.	DRAM is slower when compared to SRAM.
These are used in cache memory.	These are used in main memory.
SRAM does not need to be refreshed.	DRAM requires the data to be refreshed periodically in order to retain the data.

4.

(a) Compare and contrast the features of the following data transmission channels : 6

(i) Twisted pair cable and Optical fiber cable

(ii) Radio waves and Microwaves

(i) Twisted pair cable and Optical fiber cable

Ans:

Twisted Pair Cable	Optical Fiber Cable
The transmission of signals takes place through the metallic conducting wire.	The transmission of signals happens via glass fiber.
It is easy and simple to install and implement.	The installation and implementation of optical fiber cables are extremely tough.
It is comparatively inexpensive.	It is expensive as the cables and interfaces used are relatively expensive.
Supports low bandwidth.	Supports very high bandwidth.
It can be affected by the external magnetic field.	It cannot be affected by the external magnetic field.
In twisted pair cables, attenuation is very large.	While in optical fiber cables, attenuation is very small.
Transmission of the signal takes place in electrical form.	Transmission of the signal takes place in the form of light.
It is very effective for relatively short distances.	It is generally suited for long-distance networks among cities and countries.
Transmission of data at a relatively low speed.	Transmission of data at fast speed.

(ii) Radio waves and Microwaves

Ans:

Radio waves	Microwaves
Electromagnetic waves ranging in frequencies between 3 Kilo-Hertz and 1 Giga-Hertz are normally called radio waves.	Electromagnetic waves ranging from 1 to 300 Gigahertz are called microwaves.
These are omni-directional which implies that these travel in all directions from the source.	These are unidirectional in nature.
These waves are usually transmitted via sky.	These waves utilize a line-of-sight transmission.
These waves are widely used in cellular systems, AM, FM and other applications.	These waves are used in microwaves ovens, radar systems etc..
Radio waves have a low energy.	Microwaves have high energy.
Radio waves have low frequency wave.	Microwaves have high frequency waves.
Radio waves have a long wavelength.	Microwaves have a smaller wavelength.

(b) What is a port in the context of a computer ? Explain the use of serial port and USB port. 3

Ans: Port is a connecting socket, outside the system into which different types of cables are plugged. It is a specific place from which other devices can be physically connected. In other words, a port is an interface between the motherboard and an external device of the computer. Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speaker etc.

Uses of serial port: Serial port is used to transmit one bit of a byte, one at a time as a single stream of bits. It is used for transmitting slow data over long distances. Communication over a phone is an example of serial communication. It is a serial communication physical interface which transmits one bit at a time. They are used for connection of external devices like a modem, mouse, or keyboard.

Uses of Universal Serial Bus (USB): A USB Port can connect up to 127 peripheral devices such as a digital camera, digital speakers, scanners, speakers etc. It permits Plug and Play – configuring of expansion cards and peripheral devices as and when they are installed. It allows USB devices to be connected to each other with and transfer digital data over USB cables.

(c) List the characteristics of any two input devices and any two output devices. 4

Ans: Input and output devices allow the computer system to interact with the outside world by moving data into and out of the computer system.

Keyboard: It is the most common input device used for entering data and information into the computer system. This is the standard input device attached to all computers. The keyboard is a primary device for inputting text by pressing a set of keys. The layout of keyboard is just like the traditional typewriter of the type QWERTY. Keyboard devices can be classified into two types general purpose keyboards and special purpose keyboards. General purpose keyboard are standard keyboards used with most computer system. They are called general purpose because that have enough keys to make them useful for any type of application.

Joystick: Joystick is a remote-control device for a computer which is used for playing video games to indicate the position. It has a stick that pivots on a base and is used for controlling the action in video games. The User moves a spherical ball with the help of a stick in the joystick as opposed to the trackball where fingers are used for moving the ball. Joysticks are also used for controlling machines such as cranes, trucks, underwater unmanned vehicles, flight simulators, industrial robots etc.

Plotters: A Plotter is a device that draws pictures on a page as output, after receiving a print command from the computer. It is also called a graph plotter. In plotters pens are used to draw lines on the paper, which is placed in the plotter. Plotters produce high quality diagrams on the paper and their output quality is good. Engineers, architects and planners use plotters to generate high quality, high-precision graphic output of different sizes. For several design applications such as design of layout of an aircraft, car, and architectural design of a building and in other computer-aided design applications plotter are very useful. Plotter is of two types:

- Drum Plotter
- Flat-Bed Plotter

Speaker: Computer speakers, or multimedia speakers, are external speakers, commonly equipped with a low-power internal amplifier which produces sound as output. External speakers are connected to a computer by using a plug and socket. Computer speakers range widely in quality and in price. Laptop computers have inbuilt speakers.

(d) What is a Perverse Software ? What is the need of anti-virus software ? List any two techniques that can be used by anti-virus software to identify viruses. Also list the drawbacks of anti-virus software. 7

Ans: Perverse software is a program which causes hindrances in other programs execution in such a way resulting in modification or complete destruction of data without the user's intention or even sabotaging the operational system. It is a type of software that is designed to secretly access a computer system, without the owner‘s consent, and damage the system. The impact can be as damaging as shutting down a business, pulling down computer network or significantly impacting regular use of individual computer systems etc. The damage done can vary from something as little as changing the author's name in a document to full control of one‘s machine without the ability to easily find out.

Perverse Software is also known as Malicious software or malware. It is a type of software that is designed to secretly access a computer system, without the owner‘s consent, and damage the system. The impact can be as damaging as shutting down a business, pulling down computer network or significantly impacting regular use of individual computer systems etc. The damage done can vary from something as little as changing the author's name in a document to full control of one‘s machine without the ability to easily find out.

These are destructive software meant for damaging the data or applications by some antisocial elements and enter in the system without the consent of the owner. Malware can harm the system badly by damaging the useful data and application software, even it does not spare the operating system of the computer.

Early infectious programs, such as Internet Worm and MS DOS viruses, were written as experiments and were largely harmless or at most annoying. With the spread of broadband Internet access, malicious software has been designed for a profit, for forced advertising. Here the malware keeps track of user‘s web browsing, and pushes related advertisements.

Need for anti-virus software:

Anti-virus software is designed to combat viruses. Anti-virus software plays a crucial role in controlling computer viruses and protecting your system from malicious threats. Antivirus software protects your device from viruses that can destroy your data, slow down or crash your device, or allow spammers to send email through your account. It scans your files and your incoming email for viruses, and then deletes anything malicious preventing it from spreading further.

Techniques that can be used by anti-virus software to identify viruses :

• Signature based detection : This is oldest and most common form of anti-virus protection. It compares the contents of the infected file to a known pattern of data. Because viruses can embed themselves in existing files, the entire file is searched.

• Heuristic-based detection: This method is primarily used to identify unknown viruses by looking for malicious code or variations of such code.

• File emulation: This is another heuristic approach in which the infected program is run in a virtual environment and the actions it performs are recorded. The actions are analyzed to check for any malicious actions and carry out disinfection actions accordingly.

Drawbacks of an antivirus software:

- Antivirus software can impair a computer's performance. Active anti-virus programs can cause conflicts with other programs.
- Most popular anti-virus programs are not very effective against new viruses. The reason for this is that the virus designers test their new viruses on the major anti-virus applications to make sure that they are not detected before releasing them into the market.
- A "false positive" is when antivirus software identifies a non-malicious file as a virus. When this happens, it can cause serious problems.
- Some apparent antivirus programs are actually malware being sold as legitimate software, such as Win Fixer and MS Antivirus.
- Antivirus software generally runs at the highly trusted kernel level of the operating system, creating a potential avenue of attack.

5. Explain any five of the following with the help of an example/diagram, if needed : 5×4=20

(a) Client/server architecture

Ans: Client-Server Architecture is a computing model where tasks are divided between clients and servers. The need to share the processing demands between the host server and the client workstation is increased because of the improved capacity and power of personal computers.

In client/server architecture, the tasks or workloads are divided into:

* server programs-server programs are providers of a resource or service. They respond to client requests, process data and send back the results.

* client programs- client programs are requester of a resource or service. They initiate communication with servers to access data, files or perform tasks.

Clients and servers may reside in the same machine or they typically reside in separate pieces of hardware and communicate over a computer network. A server machine is a host that runs one or more server programs which share their resource with clients. A client

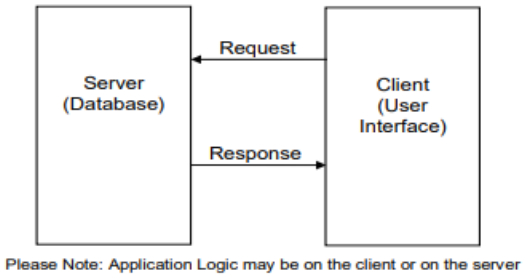
does not share any of its resources, but requests a server function or service. The server program fulfills the client request.

Clients initiate a communication session with the server. Client-server architecture enables efficient sharing of resources and centralized management of data and applications.

The client/ server system may be two-tiered, three-tiered or n-tiered.

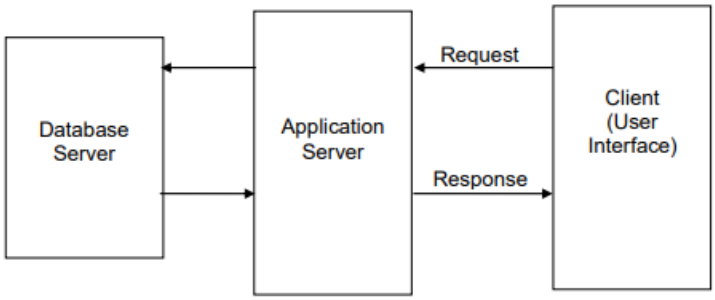
Two-tiered architecture: In this approach a database server was introduced to replace a file server. The emergence of relational database management systems and graphical user interface applications led to database server which could be accessed through the GUI based client applications. Since, the clients query the database over the network and only the relevant data is supplied to the client, the network traffic is greatly reduced in comparison to the file server system.

In two-tier, the application logic resides either in the User Interface on the client or within the database on the server. Since, clients and server interact over the network, increases in the number of users often lead to network congestion. Also, maintenance of the application becomes difficult with more users. This lack of scalability (Ability of a system to support increased demands of work, usage or service levels almost instantly, without any change and with no significant drop in cost effectiveness or quality of service) and flexibility gave rise to 3-tiered and n-tiered architectures.



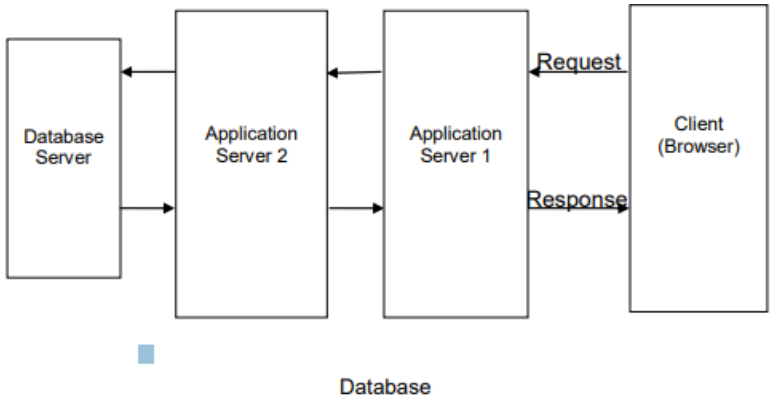
Two tier client server architecture

Three-tiered architecture: A new generation of client/server implementation takes a step further and adds a middle tier in between client and server to achieve —3-tier‖ architecture. The 3-tier architecture attempts to overcome some of the limitations of 2-tier schemes by separating presentation (user interface), processing (business functionality) and data into separate distinct entities. This leads to enhanced network performance and improved extensibility of business systems. In three-tier architecture, the application logic or process lives in the middle-tier, it is separated from the data and the user interface.



Three tier client server architecture

N-tiered architecture: The 3-tier architecture can be extended to N-tiers when the middle tier provides connections to various types of services, integrating and coupling them to the client, and to each other. Partitioning the application logic among various hosts can also create an N-tiered system. Encapsulation of distributed functionality in such a manner provides significant advantages such as reusability, and thus reliability (Ability of a computer program to perform its intended functions and operations for the specified period of time, in the specified system‘s environment, without experiencing any failure).



n-tiered architecture

(b) Open Source Software

Ans: Open Source Software is a computer software which is available along with the source code and software license that permits the code to be studied, modified and improved. It is often developed in public and collaborative manner. Open source development, follows the model of the bazaar. In an open source development model, roles are not clearly defined. The best features and functionality evolve into popular use much as good ideas evolve into popular use in the marketplace of ideas. Development is a collaborative process, resources are not scarce, and no one person or organization directs

the project. The users are treated like co-developers and so they should have access to the source code of the software.

There are two competing definitions.

The Free software definition is based on the following four freedoms:

1. The freedom to run the program, for any purpose.

2. The freedom to study how the program works, and adapt it to your needs.

3. The freedom to redistribute copies so you can help your neighbor.

4. The freedom to improve the program, and release your improvements to the public, so that the whole community benefits.

The other definition is the Open source definition promulgated by OSI. This broader definition includes permissive software licenses.

The elements are:

• Free redistribution

• Source code available

• Derivative works permitted

• Integrity of the author's source

• No discrimination against persons or groups

• No discrimination against fields of endeavor

• Distribution of license with derivative works

• License must not be specific to a product

• License must not restrict use of other software

• License must be Technological-natural

Features of open source development model are:

* Users should be treated as co-developers. The users are treated like co-developers and so they should have access to the source code of the software.

* Early releases The first version of the software should be released as early as possible so as to increase one's chances of finding co-developers early.

* High modularization: The general structure of the software should be modular allowing for parallel development on independent components.

* Several versions: There should be at least two versions of the software. There should be a buggier version with more features and a more stable version with fewer features. The buggy version (also called the development version) is for users who want the immediate use of the latest features and are willing to accept the risk of using code that is not yet thoroughly tested. The users can then act as co-developers, reporting bugs and providing bug fixes.

* Dynamic decision making structure There is a need for a decision making structure, whether formal or informal, that makes strategic decisions depending on changing user requirements and other factors.

(c) Time sharing and multiprogramming systems

Ans:

Time sharing system:

It provide a mode in which the user interacts directly with the computer. This is required for jobs such as transaction processing. In time sharing system processor's time is shared among multiple users simultaneously. In time sharing system, multiple users simultaneously access the system through terminals, with the operating system interleaving the execution of each user program in a short burst or quantum of computation. It allows the user to perform more than one task at a time, each task getting the same amount of time to execute. It is an extension of multiprogramming systems. All the tasks will run smoothly on the system. Hence, its name is also multitasking operating system. Multiple jobs are running at the CPU time and also, they use the CPU simultaneously.

Advantages of time sharing operating system:

• Response time of CPU reduces

• Idle time of CPU reduces

• Each task/ process gets an equal time slot to execute.

• User-friendly and simple to use.

• This type of operating system avoids duplication of software.

Disadvantages of Time Sharing Operating system:

• It uses a lot of resources.

• It has problem of reliability.

Multiprogramming system:

Multiprogramming system may run many programs on a single processor computer. Multiprogramming system makes it possible for many users or tasks to share the computer resources, providing fuller utilization of the system resources. Multiprogramming allows the processor to handle multiple batch jobs at a time, multiprogramming can be used to handle multiple interactive jobs.

Multiprogramming allows the processor to handle multiple batch jobs at a time, multiprogramming can be used to handle multiple interactive jobs. A multiprogramming system may run many programs on a single processor computer. If one program must wait for an input/output transfer in a multiprogramming operating system, the other programs are ready to use the CPU. The primary goal of multiprogramming is to manage the entire system's resources.

Advantages of multiprogramming system:

- It helps in improving CPU utilization and never gets idle.
- It may help to run various jobs in a single application simultaneously.
- It provides less response time.
- Various users may use the multiprogramming system at once.

Disadvantages of multiprogramming system:

- If it has a large number of jobs, then long-term jobs will require a long wait.
- CPU scheduling is required. An algorithm that decides which next process will get hold of the CPU.
- Memory management is needed in the operating system because all types of tasks are stored in the main memory.

(d) Collaborations

Ans: Collaboration is defined as an act or process of working together on a project or some intellectual activity. Collaboration involves both communication and sharing of ideas. Some of the important areas where collaboration is useful are physical science, highenergy physics, Health Science, environmental studies etc.

The collaboration helps in sharing of resources. These resources may be your intellectual efforts, hardware computing power or any other form of activity. Collaboration helps in solving complex problem domains by distributing the problems.

Most of the tools used on the internet can be used for some form of collaboration. For example, google docs is one such tool that may enable you to create a collaborative project report online. One can create a document using it and share it with your colleagues who in turn may be able to add content to it from anywhere, edit it and discuss about it using a discussion group.

Another software that can be used for collaboration is Google Wave. It allows you a shared web space for discussion or working together in a group. You may use text, photographs, maps etc. for this purpose. This software also combines collaboration with email, chat, messaging etc.

Other web-based collaboration tools are:

Zoho: Zoho is a division of ZOHO Corporation, a US-based Software Company. Zoho is a very good site for collaboration. It not only allows simple mundane tasks like group editing, document sharing, group chat, etc. but also provides some management tasks like milestone tracking, invoice creation, and other team tasks.

Volunteer Computing: It allows r hardware resources to be used for the purpose of some online project.

(e) Folders in an e-mail software

Ans: An email account has the following folders:

I) Inbox: Inbox is the main folder in your email account. It contains all the e-mails that have arrived in your e-mail account. You can click on inbox to see the mails that you have not read (shown in bold) as well as the mails that you have already read (in normal font).

II) Sent Mail: It shows all the e-mails sent by you from your e-mail account

III) Drafts: This folder stores those messages that you have created but have not been sent by you so far. These messages are saved by you for more work.

IV) Spam: Spam is unsolicited e-mails or junk mails. It is generally e-mail advertising sent to groups of people. Spam can also be termed as unwanted e-mails. Spam mail is also a big cause of computer viruses. Spam mails are identified by the mail services and placed in this folder. These spam mails are automatically deleted after a few days.

V) Trash: Deleted mail is put in the Trash folder. Trash folder allows you to get back an e-mail which has been deleted within a few days of deletion. After a few days, the mail is permanently deleted from the trash folder.

VI) Contacts: The Contacts helps you to find email address of a person whom you have saved in your Contact list.

VII) Compose Mail: Composing is addressing, writing, and sending an e-mail message. By clicking on the Compose Mail button a window appears where we can write our message in the message box and the email addresses of the person we want to send the mail.

(f) ASCII and Unicode

Ans: ASCII stands for American Standard Code for Information Interchange. ASCII is an alphanumeric code used for representing numbers, alphabets, punctuation symbols and other control characters. It is a seven-bit code that is used to identify key press on the keyboard. ASCII codes represent text in computers, communications equipment, and other devices that use text. ASCII is used for representing 128 English characters in the form of numbers, with each letter being assigned to a specific number between 0 and 127. Most computers use ASCII encoding scheme that makes the data exchange much easier. For example:

ASCII for A: 65

ASCII for B: 66

ASCII can only be used to encode characters in the English language, making it impractical for languages that use different alphabets and characters, such as Hebrew, Arabic etc. ASCII consumes less memory as compared to Unicode.

Unicode: Unicode is a computing industry standard for the consistent encoding, representation and handling of text expressed in most of the world's writing systems. Unicode provides a unique way to define every character in every spoken language of the world by assigning it a unique number. The Unicode standard is maintained by the Unicode consortium and defines more than 107,000 characters from more than 90 scripts.

Unicode can be implemented by different character encodings like UTF-8, UTF-16, UTF-32 etc. The most used encoding is UTF-8. UTF-8 is a 8-bit encoding scheme, UTF-16 is a 16-bit encoding scheme and UTF-32 is a 32-bit encoding scheme. Unicode represents a wide range of characters, formulae, texts, mathematical symbols, emojis, Greek letters, etc. Therefore, Unicode is the one of the most popular encoding scheme to encode many of the globally used characters.

The main objective of the use of Unicode is localization and internationalization of computer applications and software. Unicode is also used for programming operating systems, java applications, XML etc.

One advantage of Unicode is it allows developers to create user-friendly interfaces that can be used by people speaking different languages and it helps to simplify tasks related to data processing and information management.

(g) Disk checker software

Ans: Disk Checkers are used to check the integrity of the hard disk and Pen Drive/ Flash Drive. CHKDSK is a command which is used for this purpose. This command can be used on a computer running Windows operating system. It fixes the logical file system errors found in the disk/drive. It is a command line tools which is used to check the volumes for any potential errors. This command can be used to repair the problems related to bad sectors, lost clusters, directory errors etc.

We can run CHKDSK command from either My computer or windows explorer and from command prompt.

Once CHKDSK finishes the checking, it returns exit codes whose description is as My Personal Computer below:

Exit Code	Description
0	No errors found
1	Errors found and corrected
2	Disk cleanup was performed or disk cleanup was not performed because /f was not specified
3	Could not check the disk, errors could not be corrected or errors were not corrected because /f was not specified.

Running CHKDSK from My Computer :

* Double-click my computer and then right-click the disk drive you want to check.

* Click properties there and then click Tools.

* Under Error-checking, click Check Now button. It will open a dialog-box which shows Check disk options.

Running CHKDSK from Command Prompt:

- Click Start and then click Run.
- In Open type cmd and then press enter key, then use one of the following options:

* If you want to run CHKDSK in read-only mode, type CHKDSK at command prompt and press enter.

*If you want to repairs the error without scanning the volumes for bad sectors, type CHKDSK volume:/f at command prompt and press enter.

*If you want to repair errors, locate bad sectors, and recover read able information, type chkdsk volume:/r at command prompt and then press ENTER.