

INDEX FOR FAST TRACK MATERIAL IN INFORMATION TECHNOLOGY

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1. TELECOMMUNICATIONS AND NETWORKS

1.

Write short notes on need and scope of computer networks? (OR) Describe the ways in which a computer network can help business? (J 09 - 7M)

1. Some of the advantages of a computer network in an organization:
 - a) **File Sharing:** File sharing is the most common function provided by networks and it provides sharing and grouping of data files over the network.
 - b) **Resource Sharing:** It provides sharing of computer resources such as hard disk, printers etc. by multiple users simultaneously to reduce the cost of installing and maintaining multiple resources in the organization.
 - c) **Remote Access:** Network allows users to remotely access the data and information from organization's network via Internet in cost effective manner.
 - d) **Shared Databases:** Network facilitates simultaneous access to the shared databases to multiple users at the same time by ensuring the integrity of the database.
 - e) **Fault Tolerance:** Usually, primary and secondary line of defense backups the data in case of system failure. Additional measures can also be taken by attaching a server with uninterruptible power supply in case of power failure or backouts.
 - f) **Internet Access and Security:** It provides access to the Internet for transferring the document and to access the resources available on World Wide Web *by maintaining data security through firewall system in the organization's network.*

2.

Write short notes on telecommunication network model (Or) Components of telecommunication network model?

TELECOMMUNICATION NETWORK: A communication network is any arrangement where a sender transmits a message to a receiver over a communication channel consisting of some type of medium.

COMPONENTS: Telecommunication model consists of five basic categories of components:

1. Terminals:

- a) These are the starting and stopping points in any telecommunication network environment.
- b) Examples are Microcomputers, Office Equipment, Telephone and Transaction Terminals.

2. Telecommunications Processors:

- a) These support data transmission and reception between terminals and computers by providing a variety of control and support functions.
- b) Examples are NIC, MODEM, Multiplexer, Internetworked Processors, etc.

3. Telecommunications Media/Channels:

- a) These are the part of a network that connects the message source with the message receiver.
- b) It is a path between the sender and the receiver that carries the data in the form of signals. These are divided into two groups: Guided media and unguided media.

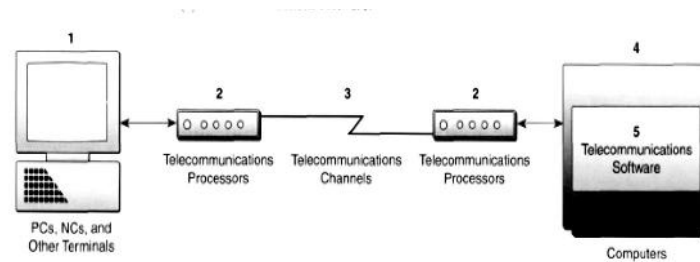
4. Computers:

- a) In a network, computers of all sizes and types are connected through media to perform their communication assignments.
- b) These include Host Computers (mainframes), Front-End Processors (minicomputers) and Network Servers (micro computers).

5. Telecommunications Control Software:

- a) It consists of programs that control and manage the functions of networks.

- b) It provides features such as performance monitoring, activity monitoring, priority assigning, transmission error correction and network problem mitigation.



3. Write about Telecommunication processors in a detailed manner?

TELECOMMUNICATION PROCESSORS: These support data transmission and reception between terminals and computers by providing a variety of control and support functions. They include:

1. **Network Interface Card (NIC):**

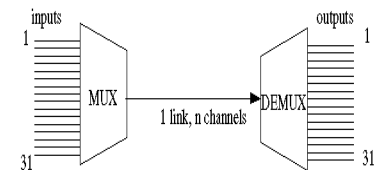
- It is a computer hardware component that connects a computer to a computer network.
- It has additional memory for buffering incoming and outgoing data packets, thus improving the network throughput.



- Modem:** It is a device that converts a digital computer signal into an analog signal (i.e. it modulates the signal) and converts an analog signal into a digital computer signal (i.e. it demodulates the signal) in a data communication system.

3. **Multiplexer: (N14RTP, N14 MTP2 –1M)**

- It is a device that allows a single communications channel to carry simultaneous data transmissions from many terminals.
- Typically, a multiplexer merges the transmissions of several terminals at one end, while a similar unit separates the individual transmissions at the receiving end.



- Internetwork Processors:** Telecommunications networks are interconnected by special- purpose communications processors called internetwork processors such as: **(N14RTP, M15 MTP2 - 5M)**

- Switch:** It is a device, which makes connections between telecommunications circuits in a network so that a message can reach its intended destination. **(N15 – 1M, M15RTP)**
- Hub:** It is a port-switching device, allows for the sharing of the network resources such as servers, LAN workstations, printers, etc.
- Repeater:** It is a device that boosts or amplifies the signal before passing it to the next section of cable in a network. **(N15 RTP, M15 MTP1 – 1M)**
- Bridge:** It is a communication processor that connects numerous LANs. It magnifies the data transmission signal while passing data from one LAN to another.
- Router:** It is a communication processor that interconnects networks based on different rules or protocols, so that a message can be routed to its destination. **(N15 – 1M, N15 RTP)**
- Gateway:** Gateway is a communication processor that connects networks that use different communication architectures.

4. Write short notes on network management and functions of network management?

NETWORK MANAGEMENT:

- Telecommunications software packages provide a variety of communication support services.
- For example, they work with a communications processor to connect and disconnect communications links and establish communications parameters such as transmission speed, mode or direction.

MAJOR NETWORK MANAGEMENT FUNCTIONS:

1. **Traffic management:** Manages network resources and traffic to avoid congestion and optimize telecommunications service levels to users.
2. **Security:** Provides authentication, encryption, and auditing functions, and enforces security policies.
3. **Network monitoring:** Troubleshoot and watch over the network, informing network administrators of potential problems before they occur.
4. **Capacity planning:** Surveys network resources and traffic patterns and users' needs to determine how best to accommodate the needs of the network as it grows and changes.

5.

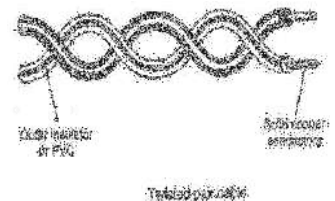
Write about different kinds of cables commonly used in LAN's (Or) What are the popular guided media available? (PM, N14RTP, N15 MTP1 – 2M)

1. Communication medium is a path between the sender and the receiver that carries the data in the form of signals.
2. Communication media is divided into two groups: Guided media and unguided media.

GUIDED MEDIA/ BOUND MEDIA: Guided Transmission Media uses a "cabling" system that guides the data signals along a specific path.

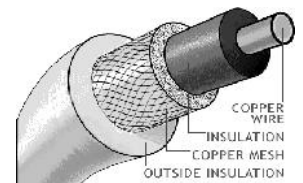
1. Twisted – Pair cables:

- a) It is ordinary telephone wire, consisting of copper wire twisted into pairs.
- b) It is used for both voice and data transmissions.
- c) It is used extensively in home and office telephone systems.
- d) It is inexpensive and easy to install.
- e) The only disadvantage is susceptible to various types of electrical interferences.



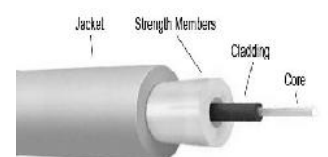
2. Coaxial Cable:

- a) This consists of copper or aluminum wire wrapped with spacers.
- b) It can carry a large volume of data.
- c) It provides high-speed data transmission used in metropolitan areas for cable TV systems, and for short-distance connection.
- d) The only disadvantage is that it is more expensive than twisted pair.



3. Fiber Optic Cables:

- a) This media consists of one or more hair-thin filaments of glass fiber wrapped in a protective jacket.
- b) They can carry digital as well as analog signals in the form of light and provides increased speed and greater carrying capacity.
- c) Data is more secure.
- d) These are easy to install because they are smaller and more flexible.
- e) A biggest disadvantage of using fiber optic is expensive.



6.

What are the popular unguided media available?

(PM, N14 RTP)

UNGUIDED MEDIA: Unguided Transmission Media or unbound media consists of a means for the data signals to travel but nothing to guide them along a specific path. The data signals are not bound to a cabling media.

Some of the common examples of unguided media are:

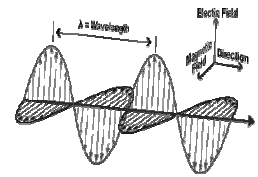
1. Terrestrial Microwave:

- a) This media uses the atmosphere as the medium through which it transmits signals, in the form of electromagnetic waves.

- b) It is used extensively for high-volume as well as long-distance communication of both data and voice.
- c) Major disadvantage is that it can bend around the curvature of the earth.

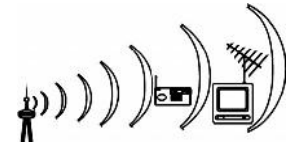
2. **Radio Waves:** (M15 MTP2 – 1M)

- a) These are an invisible form of electromagnetic radiation that varies in wavelength from around 1 millimeter to 1,00,000 kms.
- b) These are the most commonly used in Wireless LAN.



3. **Micro Waves:**

- a) These are radio waves with wavelengths ranging from as long as 1 meter to as short as 1 millimeter and the frequencies between 300 MHz and 300 GHz.
- b) These are used for communication, radar systems, radio astronomy, navigation and spectroscopy.

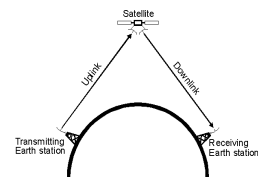


4. **Infrared Waves:**

- a) This used in industrial, scientific and medical applications.
- b) Night-vision devices using infrared illumination allow people or animals to be observed without the observer being detected.

5. **Communication Satellites:**

- a) Communication satellites use atmosphere as the medium through which it transmit signals.
- b) A satellite is some solar-powered electronic device that receives, amplifies, and retransmits signals.
- c) It acts as a relay station between satellite transmissions stations on the ground (earth stations).
- d) It is cost-effective method for moving large quantities of data over long distances.



7. Write about Local Area Networks(LAN)? Explain characteristics of LAN?

- a) Local area networks are telecommunications networks that connect information- processing devices within a limited physical area.
- b) These networks cover areas such as Offices, Classrooms, Buildings, Manufacturing plant etc.
- c) *The two main purposes of LAN are to link computers within an organisation so that they can share expensive peripheral devices and to allow these computers to communicate with each other.*

CHARACTERISTICS:

- » **Communication Media:** It uses variety of telecommunications media, such as ordinary telephone wires, coaxial cable, or wireless radio systems to interconnect workstations and peripherals.
- » **Network interface card [NIC]:** To communicate over the network, a PC usually has a circuit board called a network interface card.
- » **File Server:** It is used for managing files, servicing the network printers, handling communications etc. Server may be dedicated or non-dedicated.
- » **Network OS:** It is loaded in the server's hard disk along with system management tools and it controls telecommunications and the use of network resources.
- » **Communication and sharing:** LANs allow users in a workgroup to communicate electronically, share hardware, software, and data resources and pool their efforts when working on group projects.

8.

Why users prefer Local Area Networks?(Or) Of late many users are going for LAN system. Explain? (Or) Factors contributed to the growth of LANs (N 03, 07 - 5M)

LANs on a distributed environment allows us to have our own independent processing stations while sharing expensive computer resources like disk files, printers and plotters. Further LAN provides:

- a) **Security**: Security for programs and data can be achieved using servers that are locked physically and logically. Diskless nodes also offer security by not allowing users to download important data on floppies or upload unwanted software or virus.
- b) **Expanded PC usage through inexpensive workstation**: Once LAN is set up, it is very easy and economical to accommodate additional employees.
- c) **Distributed processing**: Many PCs are installed around the office and these machines represent the basic platform for a LAN with inter-user communication and information exchange.
- d) **Electronic mail and Message Broadcasting**: E-mail allows users to communicate easily with other employees and to communicate a message to everyone, broadcasting facility can be used.
- e) **Organizational Benefits**: With the shared computer hardware, software and peripherals, we can reduce cost & drastic reduction in time & cost of training man power to use the systems.
- f) **Data management benefits**: Since data is located centrally on the server, it becomes much easier to manage it, access it, as well as back it up.
- g) **Software cost and upgradation**: If the organization is concerned about using licensed software purchasing, a network version can save a lot of money since there would be no need to buy multiple copies of the same software for every machine in the organization.

9.

Write about Metropolitan Area Network?

1. A Metropolitan Area Network (MAN) is somewhere between a LAN and a WAN.
2. MAN refers to a network that connects systems or local area networks within a metropolitan area (roughly 40 kms in length from one point to another).
3. MANs are based on fiber optic transmission technology and provide high speed interconnection between sites.
4. MAN can support both data and voice.
5. Cable television networks are best examples of MANs that distribute television signals.

10.

Explain the basic features & usage of Wide Area Networks?

(M 94, 96, N 97)

1. Wide Area Networks are telecommunications networks that cover large geographic areas with various communication facilities such as long distance telephone service, satellite transmission, and under-sea cables.
2. These networks cover areas such as:
 - a) Large city or metropolitan area
 - b) Whole country
 - c) Many countries and continents
3. Examples of WANs are interstate banking networks and airline reservation systems.

11.

What is meant by network topology? What are different topologies or structures available?

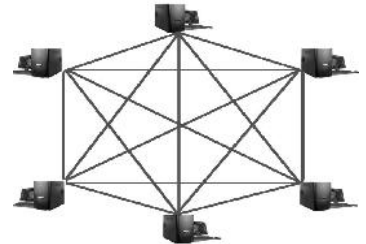
1. The geometrical arrangement of computer resources, remote devices, and communication facilities is known as network structure or network topology.
2. *In other words a network structure or topology determines how one computer in the network can communicate with other computers.*

3. Following are the most commonly used network topologies: Mesh topology / Mesh form of Network.
- Star topology / Star form of Network
 - Bus topology / Bus form of Network
 - Ring topology / Ring form of Network

12.

Write about Mesh form of Network? (OR) Which Network topology can be used in case of military installations with a very small number of nodes and why it should be used? List advantages and disadvantages? (M13, M15 -4M, N14RTP, N15RTP, M15 MTP1-2M)

- In a mesh network structure, the nodes are randomly connected using communication links.
- A mesh network may be fully connected or connected with only partial links.
- In a fully interconnected topology, each node is connected by a dedicated point to point link to every node. These are not very common because of the high cost.
- In partially connected topology, nodes are widely scattered.
- When every node is connected to every other node, a mesh network with 'n' nodes will have $\frac{n(n-1)}{2}$ number of links and the number of links coming from every node is $(n-1)$.
- This concept is applicable to wired and wireless networks.
- Only military installations, which need high degree of redundancy, may have such networks, that too with a small number of nodes.



ADVANTAGES:

- Highly reliable.
- Network problems are easier to diagnose.
- Gives the greatest amount of redundancy. *Even if one node fails, network traffic can be redirected to another node.*

DISADVANTAGES:

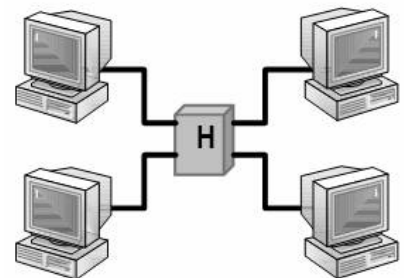
- More Cabling is needed.
- High Cost of installation and maintenance
- Adding or replacing a node will disturb the entire network.

13.

Write short notes on Star Network?

(N 08, 09, - 5M, M 11 - 4M, N 13 – 4M, M15 RTP, NOV16 - 4M)

- This is the most commonly used structure or topology.
- A star network consists of one central switch, hub or computer, which acts as a medium to transmit messages.
- The central computer is usually a mainframe (host), which acts as the file server.
- The central unit in the star network acts as the traffic controller among all the other computers tied to it.
- If a node wants to transmit information from one node to another, it can be done by sending the details to the central node, which in turn sends them to the destination.
- This is well suited to companies with one large data processing facility shared by a number of smaller departments.



ADVANTAGES:

- a) Easy to add new nodes and remove existing nodes.
- b) A node failure does not bring down the entire network
- c) Several users can use the central unit at the same time.
- d) It is easier to diagnose network problems through a central hub

DISADVANTAGES:

- a) More dependence on central hub. If the central hub fails, the entire network ceases to function
- b) Considered less reliable than a ring network.
- c) The performance and scalability of the network depends upon the capabilities of the hub.

14. Write about bus network?

(N14 - 3M, M15 MTP2 - 2M)

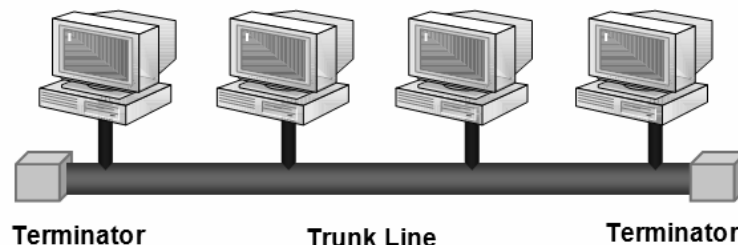
- a) In a bus network, a single length of wire, cable, or optical fiber connects a number of computers.
- b) In this method, all communications travel along this cable, which is called a bus.
- c) Bus networks have a decentralized approach.
- d) *Bus networks are the simplest way to connect multiple clients, but often have problems when two clients want to transmit at the same time on the same bus.*

ADVANTAGES:

- a) There is no host computer or file server, which makes bus network reliable as well as easy to use and understand.
- b) If one of the microcomputers fails, it will not affect the entire network.
- c) Requires least amount of cable to connect the computers together.
- d) It is easy to extend the network *by using connectors*.
- e) A repeater can also be used to extend a bus configuration.

DISADVANTAGES:

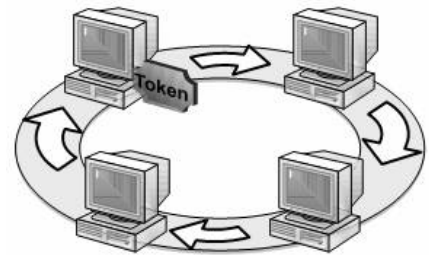
- a) Heavy traffic can slow down the network.
- b) Each new connection weakens the signal.
- c) Difficult to troubleshoot bus network.
- d) If there is a problem with main cable, the entire network goes down.



15. Write about Ring form of Network?

(N 09 - 5M, N 12 - 4M, N15RTP)

- a) A ring network has a decentralized approach.
- b) Local computer processors are tied together sequentially in a ring with each device being connected to two other devices.
- c) When one computer needs data from another computer, the data is passed along the ring.
- d) Considered more reliable and less costly than star networks



ADVANTAGES:

- a) It offers high performance for a small number of workstations.
- b) It do not require a central computer to control activity.
- c) It can spread over longer distances than other types of networks.
- d) It is also easy to expand ring network.
- e) It is more reliable.
- f) Performs better than star topology under heavy network load

DISADVANTAGES:

- a) Relatively expensive and difficult to install.
- b) Failure of one computer on the network can affect the whole network.
- c) It is difficult to trouble shoot a ring network.
- d) Adding or removing computers can disturb the network.

16.

Write about Digital Data transmission (Or) Write about Serial and Parallel Transmission.

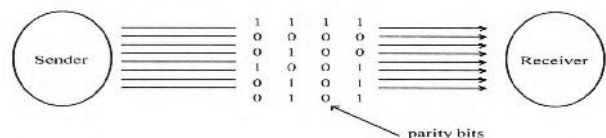
(M 06 - 4M, N 12 - 4M, N14 MTP1- 4M)

TRANSMISSION TECHNOLOGY:

- a) Binary data, consisting of 1s and 0s, may be organized into groups of n bits each. Computers produce and consume data in groups of bits.
- b) Data transmission on a communication channel between two machines can occur in several different ways: Serial and parallel

PARALLEL TRANSMISSION:

- a) In parallel transmission all the bits of each byte are transmitted simultaneously i.e. each bit will have a unique channel dedicated to it.
- b) For ASCII character we need eight channels. All bits are transmitted together and arrive at the destination together.
- c) Example - Parallel port being used for printers.



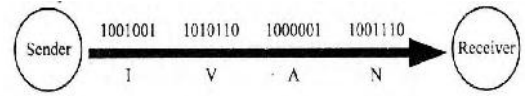
Advantages: Data can be transmitted at a very high speed.

Disadvantage:

- a) As it uses parallel paths, cross talk may occur. So, it is not suitable for transferring data over long distances.
- b) More channels are needed, hence it is costly.

SERIAL TRANSMISSION:

- a) Serial Transmission is the most commonly used method of communication. In serial transmission bits of each byte are transmitted one after the other along a single path. Then the receiver assembles the incoming bit stream into characters
- b) RS-232 is an example of serial port, used for Mouse or MODEM.
- c) Serial transmission can occur in any of the two ways - Asynchronous & Synchronous transmission.

**Advantages:**

- a) It is a cheap mode of transferring data.
- b) It is suitable to transmit data over long distances.

Disadvantage: This method is not efficient (i.e. slow) because it transfers data in series.

17.

Write about Synchronous and Asynchronous methods of data transmission.

(M 03, 05 - 4M, N 07, 11 - 4M, N14 MTP2- 4M)

SYNCHRONOUS TRANSMISSION:

(N 10 - 2M)

- a) In this method, the transmitter and receiver are paced by the same clock.
- b) The receiver continuously receives the information at the same rate the transmitter sends it.
- c) This is why the transmitter and receiver are paced at the same speed.
- d) In addition, supplementary information is inserted to guarantee that there are no errors during transmission, A group of synchronization bits must be placed at the beginning and ending of each block to maintain synchronization.

ASYNCHRONOUS TRANSMISSION:

(N 03 - 1M, M 11 - 2M)

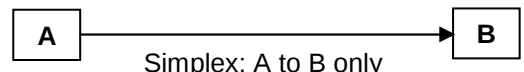
- a) In this, each character is sent at irregular intervals in time as in the case of characters entered at the keyboard in real time.
- b) So, the sender provides a synchronization signal to the receiver before starting the transfer of each message.
- c) *For example, imagine that a single byte is transmitted during a long period of silence... the receiver will not be able to know if this is 00010000, 10000000 or 00000100.*
- d) *To correct this problem, each character is preceded by some information indicating the start of character transmission by start-of transmission information (called a START bit usually 0) and ends by sending end-of transmission information (called STOP bit usually 1).*

18.

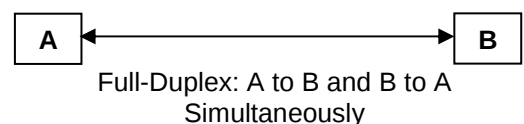
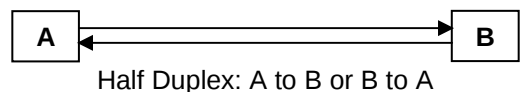
Write about different modes of data communication (Or) Transmission modes?

(N 98 - 6M, N 06, M 00, 02 - 5M, M 07 - 4M, M 12 - 4M, N 13 - 3M)

There are three different transmission modes characterized according to the direction of exchange of data.

**1. Simplex: (N14 MTP1-1M)**

- a) In this mode data is transmitted in one direction only
- b) The sending station cannot receive data. This type of connection is useful if the data do not need to flow in both directions.
- c) A terminal connected to such line may send only or receive only.
- d) For ex: computer to printer.



2. **Half duplex:**

- A half-duplex connection (alternating connection or semi-duplex) allows data can be transmitted in both the directions but only one side at a time. Thus every terminal can send and receive data but only one activity at a time.
- This type of connection makes it possible to have bidirectional communications using the full capacity of the line.
- For example, Walkie Talkie.

3. **Full duplex:**

- A full duplex connection can simultaneously transmit and receive data between two stations. It is the most commonly used communication mode.
- A full duplex line is faster. Full-duplex transmission uses two separate circuits for communication i.e. one for each direction..
- For example, mobile phones.

19.

Discuss various switching techniques used in a computer network?

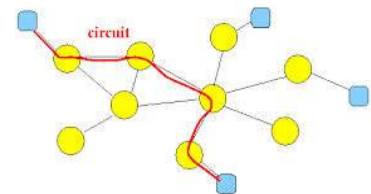
(PM, M 04 - 5M, N 11- 4M, M15 RTP)

- Based on the techniques used to transfer data, communication networks can be categorized into Broadcast and Switched networks.
- In **Broadcast networks**, data transmitted by one node is received by many, sometimes all, of the other nodes.
- In **switched-communication** networks, the data transferred from source to destination is routed through the switch nodes.
- The way in which the nodes switch data from one link to another as it is transmitted from source to destination node is referred to as a switching technique.

THREE COMMON SWITCHING TECHNIQUES:

1. **Circuit switching:**

- It is the simplest method of data communication.
- The route is dedicated and exclusive, and released only when the communication session terminates
- At any point of time only two communication devices can transmit information to each other.
- Once a circuit is established between two stations, it is exclusively used by the two parties and the dedicated link becomes unavailable to others till the call is terminated by either party.
- This will be the experience of every person using the telephone. *We make a call and either we get our destination party or encounter a busy signal.*
- A single circuit is used for the entire duration of call.
- Applications which use circuit switching go through three phases:
 - Establish a Circuit
 - Transfer of data
 - Disconnect the Circuit.



2. **Message switching/Store-and-Forward:**

(M 11 - 2M)

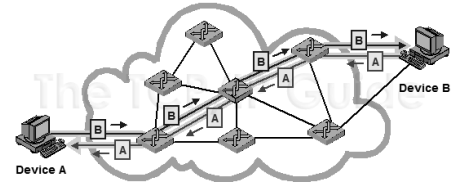
- In message switching, end-users communicate by sending each other a message, which contains the entire data being delivered from the source to destination node.
- As a message is routed from its source to its destination, each intermediate switch within the network stores the entire message, providing a very reliable service.

- c) The intermediary nodes (switches) have the responsibility of conveying the received message from one node to another in the network.
- d) Therefore, each intermediary node within the network must store all messages before retransmitting them one at a time as proper resources become available.
- e) This characteristic is often referred to as Store-and-Forward.
- f) Examples of message switching are Electronic mail (e-mail) and voice mail.

3. **Packet switching:**

(N 02 - 1M)

- a) It is a sophisticated technique of maximizing transmission capacity of networks.
- b) Packet switching refers to protocols in which messages are broken up into small transmission units called packets, before they are sent.
- c) Each packet is transmitted individually across the net.
- d) The packets may even follow different routes to the destination. Since there is no fixed path, different packets can follow different path and thus they may reach to destination out of order.
- e) This is method is currently used to transmit data in internet.



20. **Write about Open System Interconnection (OSI).**

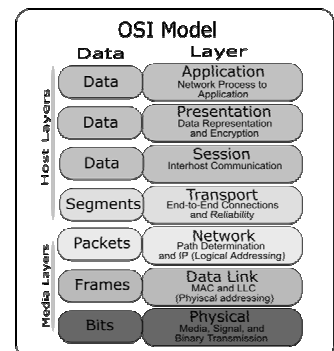
(PM, J 09 - 5M, M15 RTP)

- a) OSI or the Open System Interconnection model designed by International Standards Organization (ISO) to serve as a standard model for network architectures.
- b) It facilitates communication of heterogeneous hardware or software platforms with each other.

LAYERS: It is defined with the help of following seven layers of functions with their associated controls

- a) **Layer 1 or Physical Layer** is a hardware layer which specifies mechanical features as well as electromagnetic features. Network topology is a part of this layer.

(N15 MTP2 -2M, NOV16 -2M)



- b) **Layer 2 or Data Link Layer** is also a hardware layer which specifies channel access control method and ensures reliable transfer of data through the transmission medium.
- c) **Layer 3 or Network Layer** makes a choice of the physical route of transmission of data. It establishes, maintains, terminates, connections between the nodes and ensures proper routing of data. (N09 - 1M)
- d) **Layer 4 or Transport Layer** ensures reliable transfer of data between user processes, assembles and disassembles message packets, provides error recovery and flow control. Multiplexing and encryption are undertaken at this layer level.
- e) **Layer 5 or Session Layer** establishes, maintains and terminates sessions between user processes. Identification and authentication are undertaken at this layer level.
- f) **Layer 6 or Presentation Layer** controls on screen display of data, transforms data to a standard application interface. Encryption, data compression can also be undertaken at this layer level. This layer sometimes referred as Syntax Layer.
- g) **Layer 7 or Application Layer** provides user services by file transfer, file sharing, etc. Database concurrency and deadlock situation controls are undertaken at this layer.

21. **Write short notes on TCP/IP.**

(N07, 09 - 5M, N10 - 1M, N14 RTP)

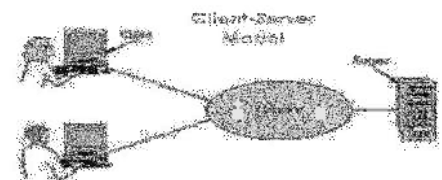
- 1. The protocol used on the Internet is called TCP/IP (Transmission Control Protocol/Internet Protocol) or internet protocol suite
- 2. TCP/IP consists of five levels or layers of protocols that can be related to the seven layers of the OSI architecture.

3. TCP/IP is used by the Internet and by all Intranets and extranets
4. Many companies and other organizations are also converting their client/server networks to TCP/IP.
5. Five levels of TCP/IP includes:

TCP/IP		The OSI Model	
Application or Process Layer		Application Layer	Provides communications services for end user applications
		Presentation Layer	Provides appropriate data transmission formats and codes
		Session Layer	Supports the accomplishment of telecommunications sessions
Host-to-Host Transport Layer		Transport Layer	Supports the organization and transfer of data between nodes in the network
Internet Protocol (IP)		Network Layer	Provides appropriate routing by establishing connections among network links
Network Interface		Data Link Layer	Supports error-free organization and transmission of data in the network
Physical Layer		Physical Layer	Provides physical transmission of data on the telecommunications media in the network.

22. Write about Client/Server model.

- a) Client server technology is an advancement of the traditional computing models.
- b) Client/Server (C/S) refers to a computing technology in which the hardware and the software components (i.e., clients and servers) are distributed across a network.
- c) It is a technology in which the server software accepts requests for data from client software and returns the results to the client. The client processes the data and presents the results to the user.
- d) Client server technology intelligently divides the processing work between the server and the workstation.
- e) The server handles all the global tasks while the workstation handles all the local tasks.
- f) The server sends only those records to the workstation that are needed to satisfy the information request. As a result network traffic is significantly reduced.
- g) This is a versatile, message based and modular infrastructure.
- h) It improves usability, flexibility, interoperability and scalability when compared to centralised, mainframe, time sharing computing.
- i) This is very fast, secure, reliable, efficient, inexpensive and easy to use.



23. How can Client computers be classified?**(PM)****Client:**

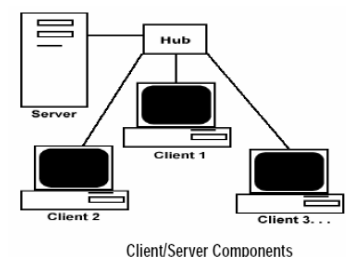
1. Client is a single-user workstation that provides a presentation services and the appropriate computing, connectivity and the database services relevant the business need.
2. Client computers can be classified as Fat Client, Thin Client or Hybrid Client.
 - a) **Fat / Thick Client:** A fat client or thick client is a client that performs the bulk of any data processing operations itself, and does not necessarily rely on the server. For example – Personal Computer.
 - b) **Thin Client:** Thin clients use the resources of the host computer. A thin client generally presents only processed data provided by an application server. A device using web application is a thin client.
 - c) **Hybrid Client:** A hybrid client is a mixture of the thick and thin client models. Similar to a fat client, it processes locally, but relies on the server for storing persistent data. Hybrid clients are well suited for video gaming.

24. Discuss the Working of Client/Server architecture.**(N15 MTP1 – 4M)**

- a) Servers are typically powerful computers running advanced network operating systems. Servers can host e-mail; store common data files and serve powerful network applications, validates login to the network and can deny access to both networking resources as well as client software.
- b) End user Personal Computer or Network Computer workstations are the Clients.
- c) Clients are interconnected by local area networks and share application processing with network servers, which also manage the networks. Client and Server can operate on separate computer platforms.
- d) Either the client platform or the server platform can be upgraded without having to upgrade the other platform.
- e) The server is able to service multiple clients concurrently; in some client/server systems, clients can access multiple servers.
- f) Action is usually initiated at the client end, not the server end.
- g) Middleware is all the distributed software needed to allow clients and servers to interact/communicate.
- h) Middleware allows for communication, directory services, queuing, distributed file sharing, and printing.

25. Discuss some of the characteristics and issues of Client/Server (C/S) architecture? (PM)**Prominent Characteristics:****(N15 – 4M)**

- a) **Service:** C/S provides as clean separation of function based on the idea of service. The server process is a provider of services and the client is a consumer of services.
- b) **Shared Resources:** A server can service many clients at the same time and regulate their access to the shared resources.
- c) **Transparency of Location:** C/S software usually masks the location of the server from the clients by the redirecting the service calls when needed
- d) **Mix-and-Match:** The ideal C/S software is independent of hardware or Operating System software platforms.
- e) **Scalability:** In a C/S environment, client work stations can either be added or removed and also the server load can be distributed across multiple servers.



- f) **Integrity:** The server code and server data is centrally managed, which results in cheaper maintenance and the safeguarding of shared data integrity.

Issues in Client/Server Network:

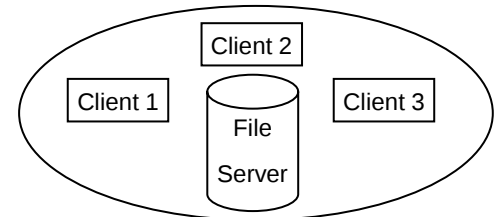
- When the server goes down or crashes, all the computers connected to it become unavailable to use.
- Simultaneous access to data and services by the user takes little more time for server to process the task.

26. Discuss Multi-Tier Architecture?

(PM)

1. Single Tier Systems/ One-Tier architecture:

- A single computer that contains a database and a front-end (GUI) to access the database is known as Single Tier System.
- Generally, this type of system is used in small businesses.
- One-tier architecture involves putting all of the required components for a software application or technology on a single server or platform.*



Single Tier Architecture

Advantages:

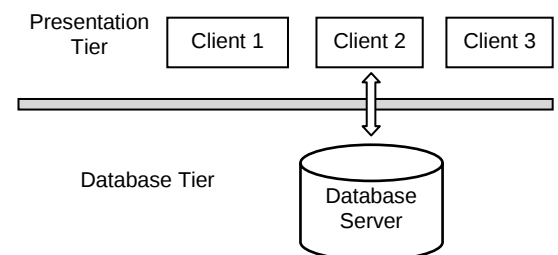
- It requires one stand-alone computer.
- It also requires only one installation of proprietary software which makes it the most cost-effective system available.*

Disadvantages:

- It can be used by only one user at a time.
- A single tier system is impractical for an organization which requires two or more users to interact with the organizational data stores at the same time.*

2. Two Tier Systems:

- A two-tier system consists of a client and a server.
- It is a software architecture in which a presentation layer or interface runs on client, and a data layer or data structure gets stored on a server.
- In other words, the database is stored on the server, and the interface used to access the database.*



2-Tier Architecture

Advantages:

- The system performance is higher because business logic and database are physically close.
- Since processing is shared between the client and server, more users could interact with system.
- It is easy to setup and maintain entire system smoothly.

Disadvantages:

- Performance decreases if number of users is greater than 100.
- Restricted flexibility.

3. Three-tier architecture:

(M15-2M)

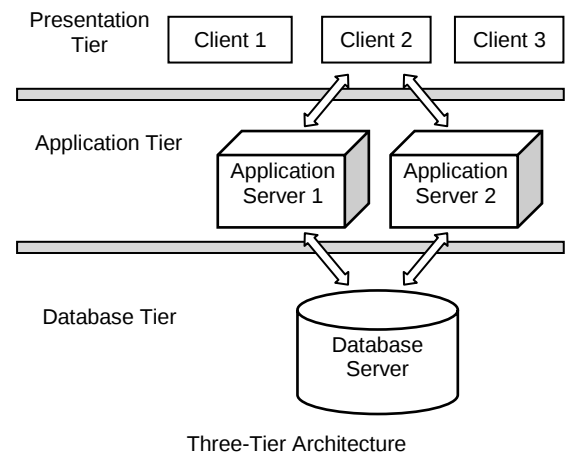
- Three-tier architecture is a client-server architecture in which the functional process logic, data access, computer data storage and user interface are developed and maintained as independent modules on separate platforms.

- b) It is a software design pattern and well-established software architecture.
- c) This is used when an effective distributed client/server design is needed that provide increased performance, flexibility, maintainability, reusability and scalability.

The three tiers in three-tier architecture:

(N15 MTP1 –2M)

- a) **Presentation Tier:** Occupies the top level and displays information related to services available on a website. This tier communicates with other tiers by sending results to the browser and other tiers in the network.
- b) **Application Tier:** Also called the middle tier, business logic or logic tier, this tier is pulled from the presentation tier. It controls application functionality by performing detailed processing.
- c) **Data Tier:** Houses database servers where information is stored and retrieved. Data in this tier is kept independent of application servers or business logic.



Advantages:

- a) **Clear separation of user-interface-control and data presentation from application-logic:** With this separation more clients are able to have access to a wide variety of server applications.
- b) **Dynamic load balancing:** If **bottlenecks** in terms of performance occur, the server process can be moved to other servers at runtime.
- c) **Change management:** It is easy and faster to exchange a component on the server than to furnish numerous PCs with new program versions.

Disadvantages:

- a) It creates an increased need for network traffic management, server load balancing, and fault tolerance.
 - b) Current tools are relatively immature and are more complex.
 - c) Maintenance tools are currently inadequate for maintaining server libraries.
4. **n-tier Architecture:**
- a) The client program has only UI code.
 - b) The UI code talks to the "middle tier" on which the business and database logic sits. In turn the middle tier talks to the database.
 - c) If necessary the middle tier can be placed on the same machine as the database.
 - d) In either case the data "traffic" is highest between database logic and database.

Advantages of Multi-tier architecture:

- a) Forced separation of UI and business logic.
- b) Low bandwidth network.
- c) Business logic sits on a small number of centralised machines.

27. Write short notes on Virtual Private Networks (VPN)

(N14 MTP2-2M)

- a) Many organizations use Virtual Private Networks (VPNs) to establish secure intranets and extranets.
- b) A VPN is a private network that uses a public network (usually the Internet) to connect remote sites or users together.



- c) A key feature of a VPN is its ability to work over both private networks as well as public networks like the Internet.
- d) VPN is a secure network that uses the Internet as its main backbone network, but relies on the firewalls and other security features.

28. Explain the threats involved in system security?**(N14 RTP, N14 MTP1– 2M)**

THREAT: It is a possible danger that can disrupt the operation, functioning, integrity, or availability of a network or system.

Network security threats can be categorized into four broad themes

1. Unstructured threats:

- a) These originate mostly from inexperienced individual's using easily available hacking tools from the Internet.
- b) Many tools available on the Internet can be used to discover weaknesses in the company's network.
- c) These include port-scanning tools, address-sweeping tools and many others.
- d) *Most of them are done out of interest rather than with a malicious intention.*

2. Structured threats:

- a) These originate from individuals who are highly motivated and technically competent.
- b) They can understand as well as create hacking scripts to penetrate into network systems
- c) Generally they target specific destination or group.
- d) Usually, these hackers are hired by organized crime, industry competitors, or state-sponsored intelligence organizations.

3. External threats:

- a) They originate from individuals or organizations working outside an organization, which does not have authorized access to organization's computer systems or network.
- b) They usually work their way into a network from the Internet or dialup access servers.

4. Internal threats:

- a) They originate from individuals who have authorized access to the network.
- b) These users either have an account on a server or physical access to the network.
- c) It may come from a discontented former or current employee or contractor.

29.**Explain the vulnerabilities involved in system security?****(N14 - 4M, M15 RTP, M15 MTP1-1M, N14 MTP2 - 4M)**

VULNERABILITY: Vulnerability is an inherent weakness in the design, configuration or implementation of a network or system that renders it susceptible to a threat. The following facts are responsible for occurrence of vulnerabilities in the software:

- a) **Software Bugs:** Software bugs are so common that users have developed techniques to work around the consequences. A bug that saves the work every half an hour or crash the computer so often is considered to be a normal part of computing.
- b) **Timing Windows:** This problem may occur when a temporary file is exploited by an intruder to gain access to the file, overwrite important data and use the same file as a gateway for advancing further into the system.
- c) **Insecure default configurations:** They occur when vendors use known default passwords to make it as easy as possible for consumers to set up new systems.

- d) **Bad Protocols:** Some protocols or the standards, by which information is exchanged over the Internet, may lack any security at all.
- e) **Trusting Untrustworthy information:** This is usually a problem that affects routers or those computers that connect one network to another.
- f) **End users:** Generally, users of computer systems are not professionals and are not always security conscious.

30. Write short notes on network security?

1. Network security is becoming more and more crucial as the volume of data being exchanged on the Internet increases.
2. Network Security Protocols are primarily designed to prevent any unauthorized user, application, service or device from accessing network data.
3. Based on the increasing demand and expectations, the security involves four aspects:
 - a) **Privacy:** (N15 MTP2 – 4M)
 - i) Privacy means that the sender and the receiver expect confidentiality.
 - ii) The transmitted message should make sense to only the intended receiver and the message should be unintelligible to unauthorized users.
 - iii) This is achieved by cryptography and encryption techniques so that the data is secured and can only be decrypted with a special algorithm, logical key, mathematical formula and/or a combination of all of them.
 - b) **Authentication:** This means that the receiver is sure of the sender's identity and that an imposter has not sent the message.
 - c) **Integrity:** This means that the data must arrive at the receiver exactly as it was sent. There must not be any changes during the transmission – either accidental or malicious.
 - d) **Non-Repudiation:** This means that a receiver must be able to prove that a received message came from a specific sender and the sender must not be able to deny sending it.

31. Discuss the concept of cryptography in a computer network.

(PM, N15 – 4M)

1. **Cryptography:** (M15 RTP, N14 MTP1 –1M)
 - a) Cryptography is the practice and study of techniques for secure communication in the presence of third parties.
 - b) It is about constructing and analyzing protocols that overcome the influence of adversaries and which are related to various aspects in information security such as data confidentiality, integrity, authentication, and non-repudiation.
2. **Encryption:** In Cryptography, encryption is the process of encoding messages (or information) in such a way that eavesdroppers or hackers cannot read it, but only authorized parties can.
3. **Decryption:** Decryption is defined as the recovery of the original message from the encrypted data.
 - a) **Plaintext:** It is the message that is to be encrypted. It is transformed by a function that is parameterized by a key.
 - b) **Cipher Text:** It is the output of the encryption process that is transmitted often by a messenger or radio.
4. **Encryption Model:**
 - a) The intruder may hear and accurately copy down the complete cipher text.
 - b) However, unlike the intended recipient, he does not know what the decryption key is and so cannot decrypt the cipher text easily.

- c) Sometimes the intruder can not only listen to the communication channel (passive intruder) but can also record messages and play them back later, inject his own messages, or modify legitimate messages before they get to the receiver (active intruder).
- d) The art of breaking ciphers is known as Cryptanalysis and the art of devising them is known as Cryptography. Both Cryptanalysis and Cryptography are collectively known as Cryptology.
5. There are two categories of encryption/decryption methods: **(N15 - 2M)**
- a) In **Secret key encryption/decryption method**, the same key is used by both sender and the receiver. The sender uses this key and an encryption algorithm to encrypt data; the receiver uses the same key and the corresponding decryption algorithm to decrypt the data. In this, the algorithm used for decryption is the inverse of the algorithm used for encryption.
- b) In **Public key encryption**, there are two keys: a private key and a public key. The private key is kept by the receiver and the public key is announced to the public.
6. There are two approaches to Encryption: **(N15 - 2M)**
- a) **Hardware Encryption:** Hardware encryption devices are available at a reasonable cost, and can support high-speed traffic. If the Internet is being used to exchange information among branch offices or development collaborators, for instance, use of such devices can ensure that all traffic between these offices is secure.
- b) **Software Encryption:** Software encryption is typically employed in conjunction with specific applications. Certain electronic mail packages provide encryption and decryption for message security.

32. Explain popular network security protocols?

(PM, N15 RTP)

NETWORK SECURITY PROTOCOLS:

- a) Network Security Protocols are primarily designed to prevent any unauthorized user, application, service or device from accessing network data.
- b) Some of the popular network security protocols include

1. SSH:

- a) Secure Shell is a program to log into another computer over a network, to execute commands in a remote machine, and to move files from one machine to another.
- b) It provides strong authentication and secure communication over insecure channels.
- c) SSH protects a network from attacks such as IP spoofing, IP source routing, and DNS spoofing.



2. SFTP:

- a) The SSH File Transfer Protocol (also known as Secure FTP and SFTP) is a computing network protocol for accessing and managing files on remote file systems.
- b) SFTP encrypts both commands and data, preventing passwords and sensitive information from being transmitted in telecommunication network.



3. HTTPS:

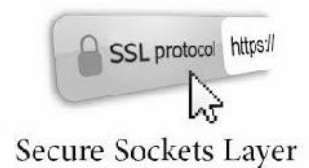
(N14 – 2M, N14 MTP2-1M, M15 MTP1-1M)

- a) Hypertext Transfer Protocol Secure (HTTPS) is a communications protocol for secure communication over a computer network, with especially wide deployment on the Internet.
- b) The security of HTTPS uses long term public and secret keys to exchange a short term session key to encrypt the data flow between client and server.



4. **SSL: (N15 MTP2 –2M)**

- a) SSL stands for secure socket layer.
- b) It is essentially a protocol that provides a secure channel between two machines operating over the Internet or an internal network.
- c) SSL protocol is typically used when a web browser needs to securely connect to a web server over the inherently insecure Internet.
- d) SSL is used to secure online credit card transactions, system logins and any sensitive information exchanged online, to secure webmail and applications.



33. Discuss FCAPS model of network management?

(PM)

1. FCAPS is the ISO Telecommunications Management Network model and frame work for network management.
2. It is an acronym for **Fault, Configuration, Accounting, Performance and Security**.
 - a) **Fault Management:**
 - i) A fault is an event that has a negative significance.
 - ii) The goal of fault management is to recognize, isolate, correct and log faults that occur in the network.
 - b) **Configuration Management:** Monitors network and system configuration information so that the impact on network operations can be tracked and managed.
 - c) **Accounting Management:** It is concerned with tracking network utilization information.
 - d) **Performance Management:** This measures and makes network performance data available so that performance can be maintained and acceptable thresholds. The network performance addresses the throughput, network response times, packet loss rates, link utilization, percentage utilization, error rates and so forth. **(M15 MTP2-1M)**
 - e) **Security Management:** Security management functions include managing network authentication, authorization, auditing from both internal and external users.

34. What tools are available to protect the information in network against intrusion or misuse? (OR) Explain various Network Security Techniques? **(N02 - 5M, N15RTP, N15MTP1 - 4M)**

1. Several tools are now available to protect information and systems unauthorized intrusion or misuse. Those are :
 - a) **Firewalls: (N15 – 2M, N14RTP)**
 - i) It is a device that forms a barrier (fence) between a secure and an open environment.
 - ii) It acts as a system or combination of systems that enforces a boundary between more than one networks.
 - iii) A firewall is a proved, effective means of protecting the firm's internal resources from unwanted intrusion.
 - b) **Message authentication:**
 - i) It makes sure that a message is really from whom it is supposed to be and that it has not been tampered.
 - ii) Regardless of a company's individual needs, Internet security policies and procedures should always be clearly defined.



c) Site blocking:

- i) It is a software-based approach that prohibits access to certain web sites that are deemed to be inappropriate by management.
- ii) For example, sites that contain objectionable material can be blocked to prevent employees from accessing these sites.
- iii) *Companies can also log activities and determine the amount of time spent on the Internet and identify the sites visited.*



d) Network Access Control: (N15RTP)

- i) NAC products enforce security policy by granting–network assets access to authorized end users.
- ii) They handle access authentication and authorization functions and can even control the data that specific users' access, based on their ability to recognize users, their devices and their network roles.



e) Anti – Malware:

- i) Anti-malware network tools help administrators to identify, block and remove malware.
- ii) They enable the IT department to tailor its anti-malware policies to identify known and unknown malware sources.
- iii) Malware is always on the lookout for network vulnerabilities - in security defenses, operating systems, browsers, applications and popular targets such as Adobe Flash, Acrobat Reader - that they can exploit to fully access a victim's network.
- iv) *Best practices call for a multipronged defense that might also include IP blacklisting, data loss prevention (DLP) tools, anti-virus and anti-spyware software, web browsing policies, egress filtering, and outbound-traffic proxies.*
- f) **Intrusion Detection System (IDS):** An Intrusion Detection System is a device or software application that monitors network or system activities for malicious activities or policy violations.



35.

Write about Intrusion Detection System (IDS)? Explain Primary IDS technologies?

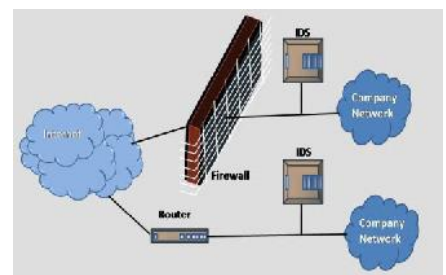
(M15RTP)

MEANING: An Intrusion Detection System is a device or software application that monitors network or system activities for malicious activities or policy violations. The goal is to monitor the network assets, to detect anomalous behavior and misuse.

PRIMARY IDS TECHNOLOGIES:

1. Network Intrusion Detection (NID):

- a) NID System is placed on a network to analyze traffic in search of unwanted or malicious events on the wire between hosts.
- b) Typically referred to as "packet-sniffers", NID devices intercept packets traveling in different communication channels.
- c) Once captured, the packets are analyzed in a number of different ways.



2. Host-based Intrusion Detection (HID):

(M13-2M)

- a) HID systems are designed to monitor, detect and respond to user and system activity and attacks on a given host.
- b) *The difference between host-based and network-based intrusion detection is that NID deals with data transmitted from host to host while HID is concerned with what occurs on the hosts themselves.*

- c) Host-based intrusion detection is best suited to combat internal threats.
- d) Majority of computer threats come from within organization. For example, disgruntled employees, corporate spies, etc.

3. **Hybrid Intrusion Detection:**

- a) Hybrid intrusion detection systems offer management of and alert notification from both network and host-based intrusion detection devices.
- b) Hybrid solutions provide the logical complement to NID and HID i.e. Central Intrusion Detection Management.

36. State some of the business uses of the internet? (N11 - 4M, M15RTP, M15 MTP1 - 3M)

- a) Providing customer and vendor support
- b) Collaboration among business partners
- c) Strategic business alliances
- d) Marketing, sales, and customer service applications
- e) Growth of cross-functional business applications
- f) Enterprise communications and collaboration
- g) Attracting new customers with innovative marketing and products.
- h) Retaining present customers with improved customer service and support.
- i) Developing new web-based markets and distribution channels for existing products.
- j) Developing new information-based products accessible on the Web.
- k) Generating revenue through electronic commerce applications.
- l) Emergence of applications in engineering, manufacturing, human resources and accounting.

37. Write about Intranets? Explain benefits and role of intranet in organization? (M15 RTP)

- a) An intranet is a network inside an organization that uses Internet technologies such as web browsers and servers, TCP/IP protocols, HTML, databases, and so on, to provide an Internet-like environment within the enterprise.
- b) The main purpose is to provide information sharing, resource sharing, communications, collaboration, and the support of business processes.
- c) Intranet is a type of information system that facilitates communication within the organisation, among widely dispersed departments, divisions and regional locations.
- d) Intranet can also be used to facilitate working groups, video conferencing and continuous updating of company database.
- e) Intranets is the main means of intra-office communication.
- f) An Intranet is protected by security measures such as passwords, encryption, and firewalls.



ADVANTAGES:

- a) Reduced information searching time
- b) Easier, faster access to information
- c) Sharing and reuse of tools and information
- d) Latest, up-to-date information,
- e) Collaborative, group working is possible.
- f) Reduced costs - printing, paper, software distribution, mailing, order processing, telephone.

ROLE OF INTRANET IN ORGANIZATION:

1. **The Business Value of Intranets:** Intranet applications support communications and collaboration, business operations and management, web publishing, and Intranet management.
2. **Communications and Collaboration:**
 - a) Intranets can significantly improve communications & collaboration within an enterprise.
 - b) Using an Intranet browser and workstation one can send and receive e-mail, voicemail, etc.
3. **Web Publishing:**
 - a) The advantages of developing and publishing hyperlinked multimedia documents to hypermedia databases accessible on Web servers has moved to corporate intranets.
 - b) The comparative ease, attractiveness, and lower cost of publishing are one of the primary reasons for the explosive growth of the use of intranets in business.
4. **Business Operations and Management:** Intranets are being used as the platform for developing and deploying critical business applications to support business operations and managerial decision making across the enterprise.

38. Write about Extranet?

(M 03, N 05 - 5M, M13-1M, RTP)

1. Extranet is a private network that uses Internet protocol and public telecommunication systems to securely share part of a business's information or operations with suppliers, vendors, partners, customers or other businesses.
2. It is part of company's intranet that is extended to users outside the company.
3. Simply put, it is the Company's website for its customers and vendors.

REQUIREMENTS: It requires security and privacy which can be provided through

1. Firewall server management;
2. Issuance and use of digital signature certificate or similar means of user authentication;
3. Encryption of messages;
4. Use of virtual private networks that pass through the public network.

BUSINESS VALUES OF EXTRANET:

(M15-2M)

- a) The web browser technology of extranets makes the customer and supplier accesses of the intranet recourses a lot easier and faster than previous business methods.
- b) Extranet enables a company to offer new kinds of interactive web enables service to their business partners.
- c) Extranets enable and improve collaboration by a business with its customers and other business partners.
- d) Extranet facilitates an online, interactive product development, marketing and customer focused process that can bring better designed products to market faster.

USES/APPLICATIONS: Companies can use Extranet to:

- a) Exchange large volumes of data using EDI.
- b) Share product catalogues exclusively with wholesaler or those "in the trade".
- c) Collaborate with other companies on joint development efforts.
- d) Jointly develop and use training programs with other companies.
- e) Share news of common interest exclusively with partner companies.

39. Write short notes on E-Commerce?

(N 02 - 5M)

- a) Electronic commerce is the process of doing business electronically. It involves automation of a variety of business-to-business and business-to-customer transactions through reliable and secure connections.
- b) It strengthens relationships with buyers, makes it easier to attract new customers, improves customer responsiveness and opens new markets on a global scale.
- c) It is the application of various communication technologies to provide automatic exchange of business information with internal and external customers, suppliers and financial institutions.
- d) It helps to cut costs while improving the quality of goods & services and increase the speed of service.
- e) It is associated with buying and selling of information, products & services via computer networks.
- f) It is a sophisticated combination of technologies and consumer-based services integrated to form a new paradigm in business transaction processing.
- g) It is the automation of the business process between buyers and sellers



40. What are the benefits of E-Commerce application implementation?

(PM, N 02, 06, M 08 - 5M)

1. EC presents many benefits to individual organizations, consumers and society as a whole. Some of them are:
 - a) Buyers can get the required goods at less cost.
 - b) It is not necessary to re-enter data. Thus information processing errors, time and overhead costs can be reduced.
 - c) Sellers can participate in on-line bidding. Thus selling costs can be reduced.
 - d) Reduced time to complete business transactions, from delivery to payment.
 - e) Creation of new markets as it is easy and cheap to reach potential customers.
 - f) Easy entry into new markets, especially geographically remote markets, for companies of all sizes and locations.
 - g) Better quality and improved variety of goods can be acquired by consumers because of increase in competition and expanded markets.
 - h) Reduced inventories.
 - i) Reduced overhead costs through uniformity, automation and large scale integration of management processes.
 - j) Reduced delivery cost, especially for goods that can also be delivered electronically.
 - k) Equal access to markets (i.e. for small-to-medium enterprises and big corporations).
 - l) Reduced use of ecologically damaging materials.
 - m) Ability to undertake more global programs.
 - n) Reduced advertising costs.

41. Explain the risks involved in e-commerce?

(PM, N14 MTP1-4M)

Some of the risks associated with e-commerce are:

- a) **Problem of anonymity:** There is need to identify and authenticate users in the virtual global market where anyone can sell to or buy from anyone, anything from anywhere.
- b) **Repudiation of contract:** There is possibility that the electronic transaction in the form of contract, sale order or purchase by the trading partner or customer may be denied.

- c) **Lack of authenticity of transactions:** The electronic documents that are produced in the course of an e-Commerce transaction may not be authentic and reliable.
- d) **Data Loss or theft or duplication:** The data transmitted over the Internet may be lost, duplicated, tampered with or replayed.
- e) **Attack from hackers:** Web servers used for e-Commerce may be vulnerable to hackers.
- f) **Denial of Service:** Service to customers may be denied due to non-availability of system as it may be affected by viruses, e-mail bombs and floods.
- g) **Non-recognition of electronic transactions:** E-Commerce transactions, as electronic records and digital signatures may not be recognized as evidence in courts of law.
- h) **Lack of audit trails:** Audit trails in e-Commerce system may be lacking and the logs may be incomplete, too voluminous or easily tampered with.
- i) **Problem of piracy:** Intellectual property may not be adequately protected when such property is transacted through e-Commerce.

42.	Write about different types of E-Commerce (or) Different classes of E-Commerce? (PM)
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Following are the general classes of e-Commerce applications

1. Business-to-Business (B2B) e-Commerce:

- a) B2B refers to the exchange of services, information and/or products from one business to another.
- b) Typically takes the form of automated processes between trading partners and is performed in much higher volumes than Business-to-Consumer (B2C) applications.
- c) It can also encompass marketing activities between businesses and not just the final transactions that result from marketing.

2. Business-to-Consumer (B2C) e-Commerce:

- a) It is defined as the exchange of services, information and/or products from a business to a consumer, as opposed to between one business and another.
- b) It has a virtual store available for consumers to purchase goods and services eliminating the need to physically view or pick up the merchandise.
- c) This model can save time and money by doing business electronically.
- d) *B2C provides safe and secure as well as easy-to-use options.*

Advantages of B2C e-commerce:

- a) Shopping can be faster and more convenient
- b) Offerings and prices can change instantaneously.
- c) Call centers can be integrated with the website.
- d) Broadband telecommunications will enhance the buying experience.

3. Consumer-to-Business (C2B) e-Commerce:

- a) In this model, consumers directly contact with business vendors by posting their project work online so that the needy companies review it and contact the consumer directly with bid.
- b) The consumer reviews all the bids and selects the company for further processing.
- c) Some examples are guru.com, rentacoder.com, getacoder.com, freelancer.com.

4. Consumer-to-Consumer (C2C) e-Commerce:

- a) It is an Internet-facilitated form of commerce that has existed for the span of history in the form of barter, flea markets, swap meets, yard sales and the like.
- b) C2C e-Commerce sites provide a virtual environment in which consumers can sell to one another through a third-party intermediary.

5. **Business-to-Government (B2G) e-Commerce:** B2G e-Commerce, also known as e-Government, refers to the use of information and communication technologies to build and strengthen relationships between government and employees, citizens, businesses, non-profit organizations, and other government agencies.
6. **Business-to-Employee (B2E) e-Commerce:** B2E e-Commerce, from an intra-organizational perspective, has provided the means for a business to offer online products and services to its employees.

43. Write about Mobile Commerce.

(M11 - 2M, M13 - 4M, N14 RTP)

MEANING:

- a) *Mobile Commerce or M-Commerce is about applications and services that are accessible from Internet-enabled mobile devices.*
- b) It is the buying and selling of goods and services through wireless handheld devices such as cellular phones, Personal Digital Assistants (PDAs), etc. It is also known as next generation e-commerce.



FEATURES:

- a) It involves new technologies, services and business models.
- b) It is quite different from traditional E-Commerce.
- c) This technology is based on Wireless Application Protocol (WAP).

FACILITIES:

- a) Enables users to access the Internet without any wired connection.
- b) *Using Bluetooth technology, smart phones are able to offer fax, e-mail, and phone capabilities all in one.*
- c) The content delivery over wireless devices is faster, more secure, and scalable. So, there is a speculation that m-commerce will surpass wire line e-commerce.

INDUSTRIES AFFECTED BY M-COMMERCE:

- a) **Financial services:** Financial services, which include mobile banking as well as brokerage services, in which stock quotes can be displayed and trading can be done from the same handheld device.
- b) **Telecommunications:** Service charges, bill payment and account reviews in telecommunications, can all be conducted from a handheld device.
- c) **Service/retail:** Consumers can place orders and pay for them on the move.
- d) **Information services:** They include the delivery of financial news, sports updates and traffic updates to individual mobile devices.

44.

Define the Electronic Funds Transfer. State some examples of EFT systems in operation? (J 09 - 5M)

- a) EFT stands for "Electronic Funds Transfer".
- b) It represents the ways the business can receive direct deposit of all payments from financial institutions to the company's bank account.
- c) Once the user signs up, money come to him directly and sooner than ever before.
- d) EFT is fast and safe. *It means the money will come to the user's bank account quicker.*
- e) The payment mechanism moves money between accounts in a fast, paperless way.

SOME EXAMPLES

AUTOMATED TELLER MACHINES (ATMS):

- a) ATMs are specialized form of Point of Sale Terminals that are designed for unattended use by a customer of a financial institution.
- b) Consumers can do their banking without the assistance of a teller, or to make deposits, pay bills, or transfer funds from one account to another electronically.
- c) These machines are used with a debit or EFT card and a code, which is often called a personal identification number or "PIN."
- d) *ATM cards can be used to get cash, or to make deposits, pay bills, or transfer funds from one account to another account electronically.*



POINT-OF-SALE (POS) TRANSACTIONS:

- a) Some Debit or EFT cards (sometimes referred to as cheque cards) can be used for shopping that allow the transfer of funds from the consumer's account to the merchant's account.
- b) To pay for a purchase, the consumer presents an EFT card instead of cheque or cash.
- c) Money is taken out of the consumer's account and put into the merchant's account electronically.



PREAUTHORIZED TRANSFERS:

- a) This is a method of automatically depositing to or withdrawing funds from an individual's account, when the account holder authorizes the bank or a third party (such as employer) to do so.
- b) For example, consumers can authorize direct electronic deposit of wages, social security, or dividend payments to their accounts.
- c) They can also authorize financial institutions to make regular, ongoing payments of insurance, mortgage, utility or other bills.

TELEPHONE TRANSFERS:

- a) Consumers can transfer funds from one account to another through telephone instructions rather than traditional written authorization.
- b) The accounts being debited can be checking or savings, for example—you can order payment of specific bills by phone.

2. INFORMATION SYSTEMS AND IT FUNDAMENTALS

1.	Define Information System? Write about Information System components.	(N14RTP)
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Information System: **(M15RTP)**

- a) It is a set of interrelated components working together to collect, retrieve, process, store and disseminate (distribute) information for the purpose of achieving objectives such as planning, coordination, analysis and decision making.
- b) Information System is generally called as Management Information System (MIS) or Computer Based Information System (CBIS).
- c) *MIS uses Computer System and Communication technology to collect information from different operational points and disseminate them at different users for decision making.*
- d) The activities in an Information System are :
 - » Collection, storing and processing of data
 - » Generation of Information Reports
 - » Dissemination of Information to right users

- e) Information System provides timely information of right quality for better management decision making for developing business strategy.

Information System components: IS consists of following six basic components/ Layers:

- a) **Hardware** – Devices which store software, database of processed data
- b) **Software** – Programs that process data to generate reports
- c) **Database** – Data collected is stored in database
- d) **Network** – Technology for sharing the data and other hardware resources
- e) **People** – Human resources to make the system operational.
- f) **Reports** – Reports are generated by the software with the help of databases for the use by users (people).

2.

Define the term Application Software? Explain types and mention advantages and disadvantages.
(N15 – 4M, N14 MTP1&2 - 2M, M15 MTP2 - 4M, N15 MTP1 - 4M)

Application Software: It is a program or a set programs used for performing useful tasks.

The different types of application software are:

- a) **Application Suite:** Has multiple applications bundled together. Related functions, features and user interfaces interact with each other. E.g. MS Office 2010 which has MSWord, MS Excel, MS Access, etc.
- b) **Enterprise Software:** Addresses an enterprise's needs and data flow in a huge distributed environment. E.g. ERP Applications like SAP.
- c) **Enterprise Infrastructure Software:** Provides capabilities required to support enterprise software systems. E.g.: email servers, Security software.
- d) **Information Worker Software:** Addresses individual needs required to manage and create information for individual projects within departments. E.g. Spreadsheets, CAAT (Computer Assisted Audit Tools), etc.
- e) **Content Access Software:** Used to access contents and addresses a desire for published digital content and entertainment. E.g. Media Players, Adobe Digital etc.
- f) **Educational Software:** Holds contents adopted for use by students. E.g. Examination Test CDs
- g) **Media Development Software:** Addresses individual needs to generate and print electronic media for others to consume. E.g. Desktop Publishing, Video Editing etc.



Benefits:

- a) **Addressing User needs:** The main advantage of application software is that it meets the exact needs of the user. Since it is designed specifically with one purpose/specific purpose in mind.
- b) **Less threat from virus:** The threat of virus infection to custom-made applications is very small, since any business that incorporates it can restrict access and can come up with means to protect their network as well.
- c) **Regular updates:** Licensed application software gets regular updates from the developer for security reasons. *Additionally, the developer also regularly sends personnel to correct any problems that may arise from time to time.*

Disadvantages:

- a) **Development is costly:** Developing application software designed to meet specific purposes can prove to be quite costly for developers.
- b) **Infection from Malware:** If application software is used commonly by many people and shared online, it carries a highly real threat of infection by a computer virus or other malicious Programs.

3.

Write about System Software in detail. (Or) What is an OS? Explain functions or activities performed by OS?
(PM, N14RTP, M15RTP, N15RTP)

- a) System software is computer software designed to operate the computer hardware and to give and maintain a platform for running application software.
- b) **Operating system** is a system program which provides an interface between the user of a computer and the computer hardware.
- c) Operating system provides a convenient environment to users for executing their programs.



Activities performed by Operating system:

- a) **Performing hardware functions:** OS acts as an intermediary between the application program and the hardware. OS facilitates application programs to perform their tasks such as obtain input, retrieve data and display output.
- b) **User Interfaces:** Today we are using user-friendly, graphics environment called Graphical User Interface (GUI) which uses icons, windows, graphics or menus.
- c) **Hardware Independence:** *Every computer could have different specifications and configurations of hardware.* Operating systems provides Application Program Interfaces - API can be used by application developers to create application software, thus obviating the need to understand the inner workings of OS and hardware. Thus, OS gives us hardware independence.
- d) **Memory Management:** OS controls how memory is accessed and maximizes available memory & storage. It also provides Virtual Memory by improving the capacity of RAM.
- e) **Task Management:** Task Management of Operating system helps in allocating resources to make optimum utilization of resources.
- f) **Networking Capability:** OS can provide systems with features & capabilities to help connect computer networks or internet. For ex. Linux & Windows 8.
- g) **File management:** OS keeps a track of where each file is stored and who can access it and it also provides the file retrieval.
- h) **Logical access security:** OS provide logical security by establishing a procedure for identification & authentication using a User ID and Password.

4.

What is CPU or microprocessor? What are the three functional units of a Central Processing Unit (CPU)?
(PM)

1. The Central Processing Unit is the actual hardware that interprets and executes the program (software) instructions and coordinates how all the other hardware devices work together.
2. The CPU is built on a small flake of silicon and can contain million of transistors.
3. The processor or CPU is like the brain of the computer.
4. The main function of CPU is to execute programs stored in memory.
5. It consists of three functional units:
 - a) **Control Unit (CU):** CU controls the flow of data and instruction to and from memory, interprets the instruction and controls which tasks to execute and when.
 - b) **Arithmetic and Logical Unit (ALU):** Performs arithmetic operations such as addition, subtraction, multiplication, and logical operations such as AND, OR, NOT and comparison operations such as Equal to, Greater than, Less than, etc.



- c) **Registers:** These are high speed memory units within CPU for storing small amount of data (mostly 32 or 64 bits). Registers could be: **(N15 MTP2-2M)**
- i) **Accumulators:** They can keep running totals of arithmetic values.
 - ii) **Address Registers:** They can store memory addresses which tell the CPU as to where in the memory an instruction is located.
 - iii) **Storage Registers:** They can temporarily store data that is being sent to or coming from the system memory.
 - iv) **Miscellaneous:** These are used for several functions for general purpose.

5. Explain various data storage devices?

Data Storage Devices refers to the memory where data and Programs are stored.

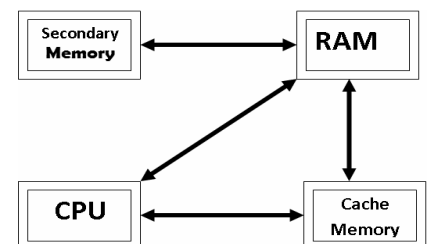
Various types of memory techniques/devices are given as follows:

1. **Internal memory:** Registers are internal memory within CPU, which are very fast and very small.
2. **Primary Memory:** These are devices in which any location can be accessed in any order (in contrast with sequential order). These are primarily of two types: **(M15RTP)**
 - a) **Random Access Memory (RAM):**
 - i) This is Read Write memory.
 - ii) Information can be read as well as modified (i.e. write).
 - iii) Volatile in nature means Information is lost as soon as power is turned off.
 - b) **Read Only Memory (ROM):**
 - i) This is non-volatile in nature (content remains even in absence of power).
 - ii) Usually, these are used to store small amount of information for quick reference by CPU.
 - iii) Information cannot be modified.
 - iv) Generally used by manufacturers to store data & Programs.
3. **Secondary Memory:**
 - a) Primary memory storage capacity is limited, expensive and volatile. Hence, it is necessary to have secondary or permanent or auxiliary storage to hold data and Programs permanently.
 - b) Some of the commonly used secondary storage devices are – magnetic tape drives, magnetic disk drives (Hard disks, floppy disks, etc.), optical disk drives (CDs, DVDs, Blue ray disks etc.)
4. **Cache memory.**
5. **Virtual memory.**

6. Write short notes on cache memory?

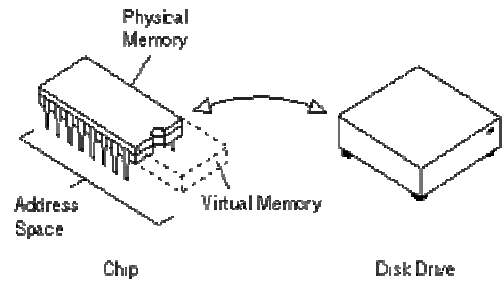
(N14 RTP)

- a) There is a huge speed difference between Registers and Primary Memory.
- b) Cache memory can be used in order to bridge the speed differences between Registers and Primary memory.
- c) Cache is a smaller, faster memory, which stores copies of the data from the most frequently used main memory locations.
- d) These copies can be accessed by Processor/Registers more rapidly than main memory.
- e) The cache acts as temporary memory and boosts processing power.
- f) It is the property of locality of reference that improves effective memory access time in a computer.



7. Write short notes on Virtual memory?**(N14RTP, N14 MTP2-1M)**

- a) Virtual memory is an imaginary memory area supported by some operating systems such as Windows in combination with the hardware.
- b) Most of the today's software's require huge amount of RAM.
- c) If a computer lacks the Random Access Memory (RAM) needed to run a Program, use virtual memory to compensate.
- d) Virtual memory is an allocation of hard disk space to help RAM.
- e) Loading of such a large size software into smaller size RAM is possible by the facility called Virtual Memory
- f) As a part of this facility the large size software gets divided into small parts called modules.
- g) One by one, the modules are loaded into RAM and perform their task. After one module work is over, the next module is loaded on to RAM overwriting the first module.

**8. Define the terms Data, Database, Database Management System (DBMS).**

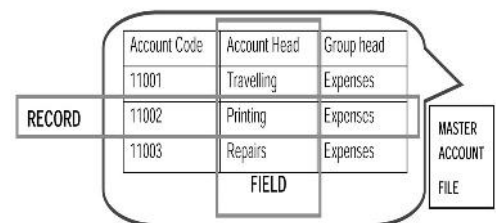
Data: Data can be defined as any fact, observation, assumption or occurrence. Data can be in the form of numbers or alphabetical characters or special symbols (=, + %, Rs. etc.).

Database: A **Database** is a collection of related data or a database is an integrated collection of logically related records and file.

Database management system: DBMS is a collection of programs that enables users to create and maintain a database and facilitates the processes of defining, constructing, and manipulating databases for various applications.

Briefly the terms can be explained below:

- a) **Characters:** These are a collection of Bits.
- b) **Field:** This is a collection of Characters.
- c) **Record:** This is a collection of Fields.
- d) **File:** This is a collection of Records.
- e) **Database:** This is a collection of Files.

**9. Explain the major objectives of organization and explain the operations performed by DBMS?**

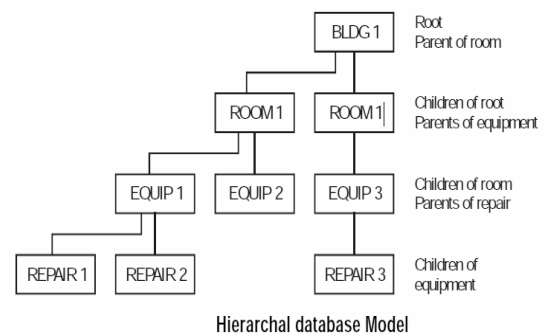
1. Every organization needs to manage its information in an appropriate and desired manner. It has to do the following:
 - a) To know the information needs
 - b) Acquiring the needed information
 - c) Organizing the acquired information in a meaningful way
 - d) Assuring information quality
 - e) Providing software tools so that users in the enterprise can access information they require.
2. To achieve the above objectives, we use Data Base Management System. The following operations can be performed on files
 - a) Adding new files to database
 - b) Deleting existing files from database

- c) Inserting data in existing files
 - d) Modifying data in existing files
 - e) Deleting data in existing files
 - f) Retrieving or querying data from existing files.
3. DBMS are software that aid in organizing, controlling and using the data needed by the application program.
 4. They provide the facility to create and maintain a well-organized database.
 5. Applications access the DBMS, which then accesses the data. Commercially available Data Base Management Systems are Oracle, My SQL, SQL Servers and DB2 etc.

10. Explain the Hierarchical Database Model in detail.

(PM)

- a) In a hierarchical database model, records are logically organized into a hierarchy of relationships.
- b) A hierarchically structured database is arranged in an inverted tree pattern.
- c) All records in hierarchy are called nodes. The top parent record in the hierarchy is called the root record.
- d) Each node is related to the others in a parent-child relationship.
- e) Each parent record may have one or more child records, but no child record may have more than one parent record.
- f) It supports one-to-one and one-to-many relationships
- g) If a particular record has to be traced then tracing will start from the root, continues downwards until the requisite record is located.



Advantages:

- a) Facilitates day to day structured operations.
- b) Data processing becomes more efficient.
- c) Simple to understand.

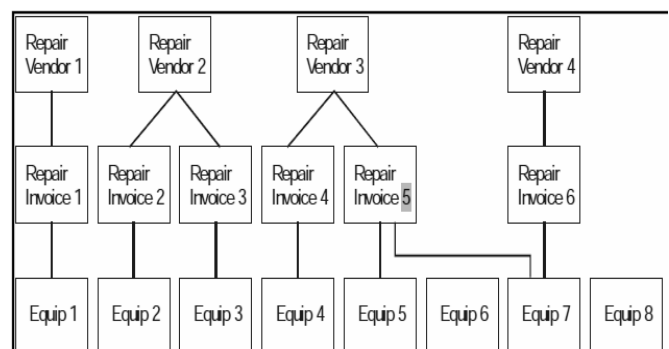
Disadvantages:

- a) It can't support many-to-many relationships.
- b) It requires multiple searches and time consuming.
- c) Parent node is deleted; all the child nodes get automatically deleted.

11. Explain the Network Database Model in detail.

(PM)

- a) It is a modified version of hierarchical database. In network database structure each node may have several parents.
- b) In this model, all types of relationships are allowed, without any restriction. Thus one-to-one, one-to-many, many-to-one and many-to-many relationships are permitted.
- c) This feature allows the network model to implement the many-to-one and the many-to-many relationship types.



- d) The network model is able to represent redundancy in data more efficiently than in the hierarchical model.
- e) These structures can be entered and traversed more flexibly.

Advantages:

- a) More flexible than hierarchical database structure.
- b) They are appropriate to support data with many-to-many relationships.
- c) Relatively efficient.
- d) Easy to restructure the information.
- e) Network data structures can be entered and traversed more flexibly.

Disadvantages:

- a) Very difficult to operate this structure.
- b) Less user friendly than hierarchical structure.

12. Explain the Relational Database Model (RDBMS) in detail.**(PM, M15 RTP)**

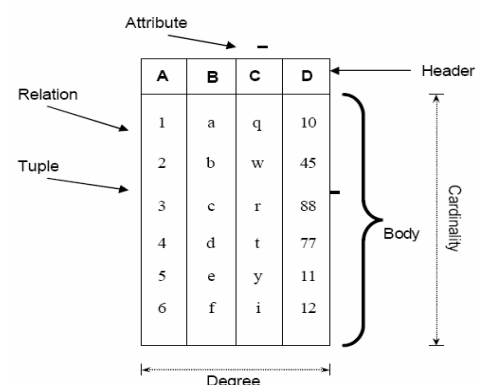
- a) The relational model represents the database as a collection of relations. Generally each relation is represented by a table of values.
- b) A relational database contains multiple tables.
- c) A table is a collection of records and each record in a table contains the several fields.
- d) A relation is a table with columns and rows. The named columns of the relation are called attributes, and the domain is the set of values the attributes are allowed to take.
- e) Tables can also have a designated single attribute or a set of attributes that can act as a "key" which can be used to uniquely identify each record in the table.
- f) A key that can be used to uniquely identify a row in a table is called a Primary key.
- g) Any column can be a key, or multiple columns can be grouped together into a Compound key.
- h) Relationships in relational databases are different from that of relationships in hierarchical and network databases.
- i) A relationship exists between two relations (i.e. tables) because there is a common attribute in the relations.

Advantages:

- a) Highly flexible to Program and retrieve data.
- b) It is much easier to use.
- c) Can handle queries in a more efficient way.

Disadvantages:

- a) Processing efficiency is comparatively low.
- b) Requires more processing capacity.
- c) Storage space requirements are high.
- d) Processing can't be done without establishing the relationships.

**13. Explain Object Oriented Database Model (OODBMS) in detail.****(PM)**

- a) It is based on the concept of objects and their interactions.
- b) An Object-oriented database provides a mechanism to store complex data such as images, audio and video, etc.

- c) Object-oriented programming is based on a series of working objects.
- d) An OODBMS helps programmers to create objects in a programming language, behave as a database object.
- e) These objects are predefined set of program code that is used to perform a specific task.
- f) IN OODBMS, new objects can be created or old objects can be modified, reused or copied.
- g) An OODBMS is a relational database designed to manage all of these independent programs, using the data produced to quickly respond to requests for information by a larger application.
- h) *Many engineering applications such as Computer Aided Design (CAD), Computer Aided Engineering (CAE) are not handled easily by relational data models.*
- i) Expert Systems, Image Processing Systems, Multimedia Systems, Computer Aided Software Engineering (CASE) can also use OODBMS to create or design several applications.

14. List out the Advantages and Disadvantages of a DBMS.

(N15 - 4M, N14RTP)

Advantages:

- a) **Minimizing data redundancy:** A database minimizes duplication of data or redundancy from file to file. Minimizing redundancy can significantly reduce the cost of storing information on hard drives and other storage devices.
- b) **Program and file consistency:** Using a DBMS, file formats and Programs are standardized. This makes the data files easier to maintain because the same rules and guidelines apply across all types of data.
- c) **Permitting data sharing:** It is very easy to share same information between different users.
- d) **Integrity can be maintained:** Data integrity is maintained with accurate, consistent, and up-to-date data. Updates and changes to the data only have to be made in one place in DBMS that ensuring Integrity.
- e) **User-friendly:** DBMS makes the data access and manipulation easier for the user. DBMS also reduce the dependence of users on computer experts to meet their data needs.
- f) **Improved security:** DBMSs allow multiple users to access the same data resources which could lead to risk to an enterprise if not controlled. Security constraints can be defined. Through the use of passwords, DBMS can be used to restrict data access to only those who should see it.
- g) **Data independence:** A database system keeps data separate from the application that uses the data. Thus, changes can be made to data definitions without making changes to every application program that uses the data.
- h) **Faster application development:** By using DBMS, application development becomes fast. The data is already available in databases, application developer has to think of only the logic required to retrieve the data in the way a user needs.

Disadvantages:

- a) **Cost:** Implementing a DBMS system can be expensive, time-consuming, and Training requirements are also quite costly.
- b) **Security:** Even with safeguards in place, it may be possible for some unauthorized users to access the database. If one gets access to database then it could be an all or nothing proposition.

15. Write about computer networks or network links.

- a) Computer Network is a collection of computers and other hardware interconnected by communication channel that allow sharing of resources and information.
- b) A network is a group of devices connected to each other.
- c) Each component, the computer or a hardware device in a computer network is called a 'Node'.

- d) *Computer networks are used for exchange of data among different computers and also to share the resources.*

Communication can be done through two ways:

(N15 MTP2 - 2M)

- a) **Connection Oriented networks:** In this network, a connection is established first and then data is exchanged. Example is telephone networks.
- b) **Connectionless Networks:** There is no prior connection is made before data exchanges. Data which is being exchanged from sender to receiver through several ways or several paths instead of a permanent path. Example is Internetworks.

Issues a computer network addresses

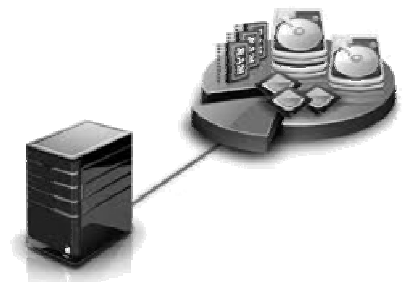
The following four terms can be considered while transferring data from Sender to Receiver.

- a) **Routing:** It refers to the process of deciding on how to communicate the data from source to destination in a network.
- b) **Bandwidth:** It refers to the amount of data which can be sent across a network in given time.
- c) **Resilience:** It refers to the ability of a network to recover from any kind of error like connection failure, loss of data etc. **(N15 RTP)**
- d) **Contention:** It refers to the situation that arises when there is a conflict for some common resource. For example, network contention (conflict) could arise when two or more computer systems try to communicate at the same time. **(M15 MTP2 -1M)**

16. What is Server? Explain different types of servers.

(PM, M15 - 4M)

1. A server is a computer (Hardware) or device on a network dedicated to run one or more services (as a host), to serve the needs of the users or clients.
2. In client-server architecture, a server is a computer Program running to serve the requests of other Programs, called the 'clients'.
3. Server performs some computational task on behalf of 'clients'. The clients either run on the same computer, or they connect through the network.
4. Servers may be broadly classified as dedicated and non-dedicated.
 - a) A **dedicated server** is completely reserved for the purpose of serving other computers and no other activity can be performed.
 - b) A **non-dedicated server** is not completely reserved for this purpose i.e. it can also be used simultaneously for other purposes.
5. There are different types of servers, based on the nature of service they provide.
 - a) **File server:** This is a computer and storage device dedicated to storing files. Any user on the network can store files on the server.
 - b) **Print server:** This is a computer that manages one or more printers.
 - c) **Network server:** This is a computer that manages network traffic.
 - d) **Database server:** This is a computer system that processes database queries.
 - e) **Application Server:** This is a Program that handles all application operations between users and an enterprise's backend applications or databases.
 - f) **Web Servers:** Web servers are computers that deliver (serves up) web pages. Every web server has an IP address and possibly a domain name. For example, if we enter the URL **http://www.icai.org** in our browser, this sends a request to the Web server whose domain name is icai.org. The server then fetches the home page named and sends it to our browser.
 - g) **Mail Server:** Mail servers move and store mail over corporate networks.



17. Describe popular Computing Architectures.**(PM)**

1. The interface between a computer's hardware and its software is Computing architecture.
2. The architecture is described by what the computer's instructions do, and how they are specified.

Computer architecture includes at least three main subcategories:

1. **Instruction Set Architecture (ISA):**

(M15 RTP, N14 MTP1 –1M)

- a) *It is the abstract model of a computing system that is seen by a machine language Programmer, including the instruction set, memory address modes, processor registers, and address and data formats.*
- b) Basically Instruction Set Architecture (ISA) is related to the Programming of a computer - that is, how the computer understands what each element in its basic language means, what instructions are to be carried out and in what order, etc.
- c) The ISA basically deals with what the chip does. It's a sort of 'bridge' between software and hardware.

Classification of Instruction Sets: These are of basically two types:

- a) **Complex Instruction Set Computer (CISC):**

(N15 MTP1 -2M)

- i) If the control unit contains a number of micro-electronic circuitry to generate a set of control signals and each micro- circuitry is activated by a micro-code, this design approach is called CISC design.
- ii) Examples of CISC processors are: Intel 386, 486, Pentium, Pentium Pro, Pentium II, Pentium III processors etc.
- iii) *CISC chips have a large, variable length and complex instructions and generally make use of complex addressing modes.*
- iv) But at the same time, they are complex as well as expensive to produce.
- v) Now-a-days, most of the personal computers use CISC processors.

- b) **Reduced Instruction Set Computer (RISC):**

- i) To execute each instruction, if there is separate electronic circuitry in the control unit, which produces all the necessary signals, this approach of the design of the control section of the processor is called RISC design. It is also called hard-wired approach.
- ii) Examples of RISC processors: IBM RS6000, MC88100 processors etc. *RISC processors use a small and limited number of instructions and mostly use hardwired control unit.*
- iii) These consume less power and have high performance.
- iv) *However, RISC processors are faster, less complex and less expensive than CISC processors because of their simpler design.*
- v) Now-a-days, most of the workstation computers use RISC processors.

2. **Micro Architecture:**

(N14 RTP, N14 MTP2-1M)

- a) It, also known as Computer Organization. *It is a lower level detailed description of the system that is sufficient for completely describing the operation of all parts of the computing system, and how they are inter-connected and inter-operate in order to implement the ISA.*
- b) The micro architecture can be seen as how the ISA does and what it does.
- c) The micro architecture essentially forms a specification for the logical implementation.

3. **System Design:** It includes all of the other hardware components within a computing system such as:

- a) **System interconnects-Computer buses and switches:** Computer bus is a communication system that transfers data between components inside a computer, or between computers that covers all related hardware components (wire, optical fibre, etc.) and software, including communication protocol.

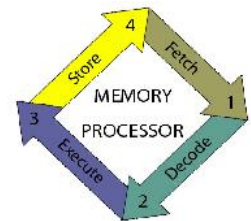
(M15 MTP1 - 1M)

- b) **Memory controllers and hierarchies:** The memory controller is a digital circuit which manages the flow of data going to and from the main memory and can be a separate chip or integrated into another chip.
- c) **CPU off-load mechanisms-Direct Memory Access (DMA):** DMA is a feature of modern computers that allows certain hardware subsystems within the computer to access system memory independently of the central processing unit (CPU).
- d) **Issues-multi-processing, virtualization, software features etc.**
 - i) **Multiprocessing** is the use of two or more Central Processing Units (CPUs) within a single computer system to allocate tasks between them.
 - ii) **Hardware Virtualization or Platform Virtualization** refers to the creation of a virtual machine that acts like a real computer with an operating system. *Software executed on these virtual machines is separated from the underlying hardware resources.*

18. Write about Machine cycle? Explain the 'Computing Process' in detail?

MACHINE CYCLE:

- a) **Instruction Fetch (IF):** Fetch an instruction from the current program, pass it to the next stage.
- b) **Instruction Decode (ID):** Instruction would be decoded to figure out what we actually need to do.
- c) **Execution (Ex):** Execution unit will then perform some operation like an addition, multiplication or Memory access.
- d) **Write Back (WB):** The result to another register. So, it is ready to go for the next operation.



The above is the Machine Cycle, Fetch-Decode-Execute-Store which gets executed within CPU. Fetch and decode are done by Control Unit (CU) whose job is to understand and explain to Arithmetic Logic Unit (ALU). ALU is used to execute and results are stored in Register.

Computing process:

- a) **Load:** Load some data from the RAM into a register.
- b) **Store:** Free up a register by storing its data back into RAM.
- c) **Add:** Add two pieces of data together. This could also be other common math operations like subtract, multiply, divide, shift, etc.
- d) **Compare:** Check to see if one piece of data is bigger or smaller than another.
- e) **Branch:** jump to the new location in the program code and continue executing from there.

19. Write briefly about Mobile Computing? (PM, N14 – 4M, M15 MTP2 - 4M)

1. Mobile Computing is the use of portable computing devices (such as laptop and handheld computers), in combination with mobile communications technologies, to enable users to access the Internet and data on their home or work computers, from anywhere in the world.
2. Mobile computing is enabled by use of mobile devices such as PDA, laptops, mobile phones, smart phones, tablet PC and Palmtops on a wireless network.
3. Mobile computing involves Mobile Communication, Mobile Hardware and Mobile Software.
 - a) **Mobile Communication:**
 - a) Mobile Communication refers to the infrastructure put in place to ensure that seamless and reliable communication goes on.
 - b) These would include devices such as Protocols, Services, Bandwidth and Portals necessary to facilitate and support the services. The data format is also defined at this stage.

- c) The signals are carried over the air to intended devices that are capable of receiving and sending similar kinds of signals.
- d) *It will incorporate all aspects of wireless communication.*

b) Mobile Hardware:

(M15 RTP)

- a) Mobile Hardware includes mobile devices or device components that receive or access the service of mobility.
- b) They would range from Portable laptops, Smart phones, Tablet PC's to Personal Digital Assistants.
- c) These devices will have receptors that are capable of sensing and receiving signals.
- d) *These devices are configured to operate in full duplex, whereby they are capable of sending and receiving signals at the same time.*

c) Mobile Software:

(N15 RTP)

- a) Mobile Software is the actual Program that runs on the mobile hardware.
- b) It deals with the characteristics and requirements of mobile applications.
- c) This is the engine of that mobile device.
- d) *In other terms, it is the essential component that makes the mobile device operates.*

20. Explain Business Applications of Mobile Computing.

(N15 MTP2 - 4M)

Some examples of business applications are:

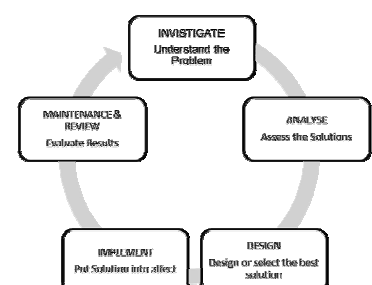
- a) There is increase in workforce productivity as mobile device enables employees to work from anywhere, anytime by accessing and updating information as required.
- b) Customer service can be improved by responding to customer queries on site or off site.
- c) Incident management can be improved by resolving problems faster, without limitation of time, as the concerned employees can attend to these regardless of their location.
- d) Business processes can be transformed by using mobile devices. *Enterprises can focus on providing customers and employees with access to information in different ways and provide the latest information.*
- e) Enterprises can dynamically modify and update their offerings and offer new products and services altogether.
- f) Mobile computing gives users the freedom to roam, with access to data and services at any time and in any place.
- g) This technology to create innovative opportunities for improving the quality and efficiency of business processes and services.

21. Write about the concerns of the Mobile Computing.

(N14 - 4M)

Major concerns or problems related to mobile computing are given as follows:

- a) Mobile computing has its fair share of security concerns as any other technology.
- b) **Dangers of misrepresentation** -Another problem plaguing mobile computing are credential verification.
- c) **Power consumption**: When a power outlet or portable generator is not available, mobile computers must rely entirely on battery power.
- d) Potential health hazards.



22.

What is Information System Life Cycle? Explain different phases of System development life cycle.
(PM, M15 - 2M, N14RTP, N14 MTP2 - 4M)

1. Information System Life Cycle is also known as Software/System Development Life Cycle (SDLC).
2. It provides a sequence of activities for system designers and developers to build an information system.
3. It consists of a set of phases in which each phase of the SDLC uses the results of the previous one.
4. Various phases for developing an Information System are given as follows:
 - a) **Phase 1: System Investigation:** This phase examines that 'What is the problem and is it worth solving'? A feasibility study is done under the dimensions – Technical, Economical, Legal, Operational etc.
 - b) **Phase 2: System Analysis:** This phase examines that 'What must the Information System do to solve the problem'?
System analyst would be gathering details about the current system and will involve interviewing staff; examining current business; sending out questionnaires and observation of current procedures.
The Systems Analyst will:
 - i) Examine data and information flows in the enterprise using data flow diagrams;
 - ii) Establish what the proposed system will actually do (not how it will do it);
 - iii) Analyze costs and benefits;
 - iv) Outline system implementation options. (e.g. in-house or using consultants);
 - v) Consider possible hardware configurations
 - vi) Make recommendations.
 - c) **Phase 3: System Designing:** This phase examines that 'How will the Information System do what it must do to obtain the solution to the problem'? (N15RTP)
This phase specifies the technical aspects of a proposed system in terms of
 - i) **Hardware platform:** Computer, network capabilities, input, storage and output devices;
 - ii) **Software:** Programming language, package and database;
 - iii) **Outputs:** Report layouts and screen designs;
 - iv) **Inputs:** Documents, screen layouts and validation procedures;
 - v) **User interface:** How users will interact with the computer system;
 - vi) **Modular design:** Of each program in the application;
 - vii) **Test plan:** Develop test data;
 - viii) **Conversion plan:** How the new system is to be implemented;
 - ix) **Documentation:** Including systems and operations documentation. Later, a user manual will be produced.
 - d) **Phase 4: System Implementation:** This phase examines that 'How will the solution be put into effect'?
This phase involves coding and testing of the system; acquisition of hardware and software; and either installation of the new system or conversion of the old system to the new one.
In Installation, Installing the new hardware, which may involve extensive re-cabling and changes in office layouts; Training the users on the new system; and Conversion of master files to the new system or creation of new master files.
 - e) **Phase 5: System Maintenance and Review:** This phase evaluates results of solution and modifies the system to meet the changing needs. Post implementation review would be done to address Programming amendments; Adjustment of clerical procedures; Modification of Reports, and Request for new programs.

23. Write short notes on feasibility study under systems investigation of SDLC?

Feasibility Study refers to a process of evaluating alternative systems through cost/benefit analysis so that the most feasible/possible and desirable system can be selected for development.

- a) **Technical feasibility:** Does the technology exist to implement the proposed system or is it a practical proposition
- b) **Economic feasibility:** Is proposed system cost-effective.
- c) **Legal feasibility:** Is there any conflict between the proposed system and legal requirements
- d) **Operational feasibility:** Are the current work practices and procedures adequate to support the new system.
- e) **Schedule feasibility or time feasibility:** How long will the system take to develop, or can it be done in a desired time-frame.

24. Write short notes on fact finding techniques of systems analysis?

This phase examines the 'What must the Information System do to solve the problem'. System analyst would be gathering details about the current system and will involve:

- a) **Interviewing staff:** at different levels from end-users to senior management;
- b) **Examine current business:** systems documents and output including current order documents, computer system procedures and reports used by operations and senior management;
- c) **Sending out questionnaires:** that have to be carefully constructed to elicit unambiguous answers.
- d) **Observation of current procedures:** by spending time in various departments. A time and motion study can show where procedures could be more efficient or to detect bottlenecks.

25. Write short notes on changeover or conversion methods on systems implementation. (OR) What are the major activities involved in the conversion phases of system implementation in SDLC. (PM)

This phase examines 'How the Solution will be put into effect'. This phase involves the following steps: In Conversion, there are following major activities:

- a) **Direct Changeover:** The user stops using the old system one particular day and starts using the new system from thereon, usually over a weekend or during a slack period.
- b) **Parallel Conversion:** The old system continues alongside the new system for a few weeks or months.
- c) **Phased Conversion:** Used with larger systems that can be broken down into individual modules which can be implemented separately at different times.
- d) **Pilot Conversion:** New system will first be used by only a portion of the enterprise, for example at one branch or factory.

26. Write short notes on types of system maintenance. (OR) Explain the system maintenance objectives in SDLC.

This phase evaluates results of solution and modifies the system to meet the changing needs. Post implementation review would be done to address:

- a) Programming amendments.
- b) Adjustment of clerical procedures.
- c) Modification of Reports.
- d) Request for new Programs.

System maintenance could be with following different objectives:

- Perfective Maintenance:** This implies that while the system runs satisfactorily, there is still room for improvement.
- Adaptive Maintenance:** All systems will need to adapt to changing needs within a company.
- Corrective Maintenance:** Problems frequently surface after a system has been in use for a short time, however thoroughly it was tested. Any errors must be corrected.

RECENT TECHNOLOGIES/DEVICES

27. Write about Bluetooth technology.

(PM, N14 - 2M, N14RTP, M15 MTP1 - 2M)

Introduction:

- » Bluetooth is a wireless technology standard for exchanging data over short distances from 30 to 50 meters from fixed and mobile devices.
- » It creates Personal Area Networks (PANs) with high levels of security.



Usage:

- Using this technology, users can easily exchange files between computers, cellular phones, pagers, and Personal Digital Assistants over short distances.
- Users can easily synchronize the information in their portable devices with a desktop or notebook computers.
- Mobile phone with Bluetooth allows us to send pictures, videos, exchange business cards and also transfer files to our PC.
- Both data and voice transmissions can be sent and received through the use of short range networks.
- Bluetooth is really like a low-power, short-range radio signal.
- Few devices that utilize Bluetooth technology are:
 - Keyboards and mouse
 - Printers
 - Cell phones and headsets
 - PDAs (Personal Digital Assistants)
 - Desktop and laptop computers
 - Digital cameras.

28. Write about Wi-Fi technology.

(PM, M15 MTP1 - 1M)

- Wi-Fi stands for Wireless -fidelity.
- Wi-Fi is a popular Wireless networking technology that uses radio waves to provide wireless high-speed Internet and reliable network connections.
- Wi-Fi networks have limited range.
- A typical wireless access point might have a range from 32 meters to 95 meters.
- Wi-Fi is based on IEEE 802.11 to provide secure, reliable, fast wireless connectivity.



Usage:

- A Wi-Fi network can be used to connect electronic devices to each other, to the Internet, and to wired networks.



- b) Large companies and campuses often use Wi-Fi to connect buildings, meeting rooms, laboratories, Classrooms and large auditoriums.
- c) Wi-Fi networks also work well for small businesses, providing connectivity between mobile salespeople, floor staff and behind-the-scenes finance and accounting departments.
- d) Wi-Fi supports built-in flexibility that allows dynamic changes and growth.
- e) Wi-Fi can be less secure than wired connections because an intruder does not need a physical connection.

29. Write about Smart phone.

(PM, N14RTP)

- a) A Smart Phone is a mobile phone built on a mobile operating system with more advanced computing capability connectivity than a feature phone.
- b) This handheld device integrates mobile phone capabilities with the more common features of a handheld computer or PDA.
- c) Smartphone allows users to store information, e-mail and install programs.
- d) Modern Smart Phones also include high-resolution touch screens and web browsers for internet browsing.
- e) It also supports Wi-Fi and mobile broadband.

30. Write about Touchpad.

(PM, M15RTP, N14 MTP1 - 2M)

- a) A Touchpad is a pointing device featuring a tactile sensor, a specialized surface that can translate the motion and position of a user's fingers to a relative position on screen.
- b) Touchpads are common feature of laptop computers.
- c) These are also used as a substitute for a mouse where desk space is limited.
- d) These are also used on Personal Digital Assistants (PDAs) and some portable media players.
- e) Touchpads operate in one of several ways, including capacitive sensing and conductance sensing.

31. Write about Android.

(PM, M15 - 2M, M15 MTP2 - 2M)

- a) Android is a Linux-based operating system designed primarily for touch screen mobile devices such as smart phones and tablet computers.
- b) Android devices come in all shapes and sizes, with vibrant high-resolution displays and cameras.
- c) The user interface of Android is based on direct manipulation, using touch such as swiping, tapping, pinching and reverse pinching to manipulate on-screen objects.
- d) Android is open source software, which allows the software to be freely modified and distributed by device manufacturers, wireless carriers and developers.

32. Why Most of the organisations use Computers and Information Technology?

Due to the following reasons, today most organizations use computers and technology.

1. Communication Capabilities:

- a) IT provides the enterprises with the resources, to communicate quickly and effectively.
- b) With these communication capabilities, enterprises can integrate their business functions across different geographical areas.
- c) Any global enterprise with an international presence can integrate its business locations using communication capabilities offered by IT.

E.g.: Email, video conferencing equipment and internal chat rooms, Voice Over Internet Protocol (VOIP) telephones and smart-phones offer even more high- tech ways for employees to communicate. Skype is one such popular VOIP service.

WhatsApp Messenger: is a cross-platform mobile messaging application which allows us to exchange messages without having to pay for SMS. (N15 - 2M)

2. **Data and Information Management:**

- a) Today, most enterprises store digital versions of documents on servers, storage devices and on cloud.
- b) These documents are instantly available to anyone with access rights, regardless of their geographical location.
- c) IT enables Information Security, which encompassing the protection of information from accidental or intentional misuse by persons inside or outside an enterprise.
- d) IT provides security to physical and logical assets.

3. **Automated Processes:**

- a) Business Process Automation (BPA) is a strategy that is used to optimize and streamline the essential business processes, using the latest technology to automate the functions involved in carrying them out. (M15RTP)
- b) The idea behind BPA is to allow the organizations to extract maximum benefit by using the available resources to their best advantage, while keeping the operational cost as low as possible.

33. What are the activities which are tied up with the BPA application? (or)What are the three critical pillars of Business Process Automation (BPA)? (PM)

BPA rests on the following three critical pillars:

- a) **Integration:** BPA allows applications and operating systems not only to read data that the systems produce, but also to pass data between the component applications of the business process and to modify the data as necessary.
- b) **Orchestration:** The process of orchestration enables the ability to bring tasks that exist across multiple computers and different business departments or branches under one umbrella that is the business process itself.
- c) **Automation:** Orchestration and integration unit with automation to deliver the capability to provide a rules-based process of automatic execution that can span multiple systems and enable a more effective, nimble and efficient business process.

34. What are The Objectives of Audit? Explain Differences in audit procedures? (N15RTP, N15 MTP2 - 4M)

The objectives of Audit would vary depending on the type, purpose objective and scope of audit. However, the general objectives of auditing in a computerized environment could include the following objectives:

- a) **Existence:** Verify that the assets, liabilities, ownership, and/or activities are real.
- b) **Authorization:** Verify that events have occurred in accordance with management's intent.
- c) **Valuation:** Verify that the accounting values fairly present items worth.
- d) **Cutoff:** Verify that the transaction is recorded in the proper accounting period.
- e) **Compliance:** Verify that the processing is in compliance with government laws and regulations, generally accepted accounting procedures, and the organization's policies and procedures.
- f) **Operational:** Verify that the Program, area, or activity is performed economically efficient, and effectively.
- g) Assisting management in finding ways for implementing internal control recommendations.

- h) Participating in specifying and designing computer control and other features for systems to be installed.
- i) Determining whether efficient use is made of the organization's Computer resources.
- j) Determining whether computer system used accomplishes the business objectives and goals.

Differences in audit procedures are given as follows:

- a) **Study Technical Aspects:** *Gather evidential matter related to technical aspects of systems under study, including all relevant documentation describing the computer facility, application Programs, operating procedures, security procedures and so on.*
- b) **Use Unique Techniques:** *Audit in a computerized environment would require application of unique techniques to these efforts. For example, the audit planning step includes review of technical documentation and interviewing technical specialists. The auditor must understand the procedures for testing and evaluating Computer Controls.*
- c) **Audit Software Usage:** *These procedures include the use of generalized audit software to survey the contents of data files, the use of specialized software to assess the contents of operating system parameter files and flow-charting techniques for documenting the automated applications.*

35.	Explain the Need for Controls in Information Systems.	(NOV16 - 4M)
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- a) Technology has increased the ability to capture, store, analyse and process tremendous amounts of data and information by empowering the business decision maker.
- b) With the advent of affordable hardware, technology has become a critical component of business.
- c) Today's dynamic global enterprises need information integrity, reliability and validity for timely flow of accurate information throughout the organization.
- d) Safeguarding assets to maintain data integrity to achieve system effectiveness and efficiency is a significant control process.
- e) A well designed information system should have controls built-in for all its sensitive or critical sections.

IS control procedure may include:

- a) Strategy and direction
- b) General Organization and Management
- c) Access to IT resources, including data and Programs
- d) System development methodologies and change control
- e) Operation procedures
- f) System Programming and technical support functions;
- g) Quality Assurance Procedures
- h) Physical Access Controls
- i) Business Continuity Planning(BCP) and Disaster Recovery Planning (DRP)
- j) Network and Communication
- k) Database Administration
- l) Protective and detective mechanisms against internal and external attacks.

3. BUSINESS INFORMATION SYSTEMS

1. What is Information System?

(PM, N15 MTP1 - 5M)

1. Information:

(N15RTP, M15 MTP2 - 1M)

- a) Data is a raw fact and can take the form of a number or statement, such as a date or a measurement, which has some meaning.
- b) Processing of data is known as information.
- c) Some examples of information include aggregating, which summarizes data by such means as taking an average value of a group of numbers.

2. System:

- a) The system is a set of mutually related, coordinated elements or components that operate together to accomplish objectives by taking inputs and producing outputs in an organized manner.
- b) A system contains several subsystems with sub goals, all contributing to meet the overall system goal.
- c) For example, the finance operations and marketing areas of an organization should all have goals which together help to achieve overall corporate objectives.

3. Information System [IS]:

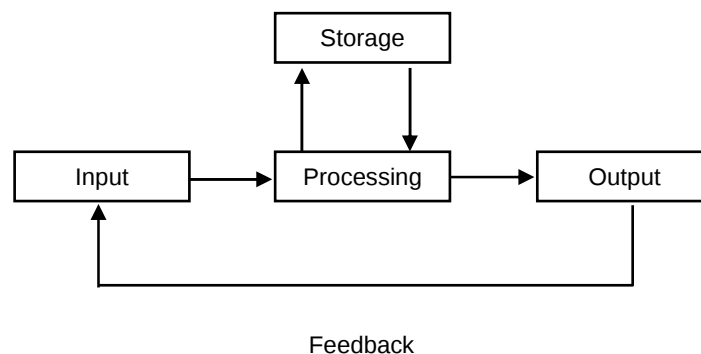
(N15 MTP1 - 1M)

- a) Information System (IS) is a combination of people, hardware, software, communication devices, network and data resources that processes data and produce information for a specific purpose.
- b) Information system (IS) refers to the interaction between the processes and technology.

4. Five Components of Generic System:

(N15 MTP1 - 4M)

- a) Input is the data flowing into the system. (Key-in instructions or commands, typing, scanning).
- b) Processing is the action of manipulating the input into a more useful form. (calculating, reporting)
- c) Storage is the means of holding information for later usage.
- d) Output is the information flowing out of a system (printing reports, displaying results)
- e) Feedback is the method that controls the operation.



2. What are the different types or levels of Information Systems.

An Information system can support Strategy, Management, Knowledge and Operations.

1. Strategic Level Systems:

(N15RTP)

- a) Strategic Managers use IS to track and deal with strategic issues, assisting long-range planning.
- b) A principle area is tracking changes in the external conditions such as market sector, employment levels, share prices, etc and matching these with the internal conditions of the organization. Ex. EIS

2. Management-Level Systems: Used for the monitoring, controlling, decision-making, and administrative activities of middle management. Ex. MIS and DSS

3. **Knowledge-Level Systems:** These systems support discovery, processing and storage of knowledge and data workers. EX. KWS and OAS. **(M15RTP)**
4. **Operational-Level Systems:** Support operational managers in tracking elementary activities and also includes tracking customer orders, invoice tracking, etc. Ex. TPS.

3. Who uses Information Systems?

1. **Strategic Level:**
 - a) These are senior managers or Top-level managers who hold the titles such as Chief Executive Officers, Chief Financial Officers, Chief Operational Officers, Chief Information Officers and Chair Person of the Board, President, Vice President and Corporate Head Managers, who take decisions that will affect the entirety of the organization.
 - b) Top Managers set goals for the organization and direct the company to achieve them.
 - c) Top Managers are ultimately responsible for the performance of the organization.
2. **Management Level:**
 - a) These are Middle Managers who are in the levels below top managers and hold the job titles like General Manager, Regional Manager etc.
 - b) Middle-level Managers are responsible for carrying out the goals set by Top Management.
3. **Knowledge Level:** These include knowledge and data workers who are selected, recruited and trained in a special manner.
4. **Operational Level:** These include Operational Managers or supervisors who are responsible for the daily management of the line workers who actually produce the product or offer the service.

4. Explain Transaction Processing System (TPS). Explain typical TPS and attributes of TPS. **(PM, N14 MTP2 - 1M)**

1. A **Transaction Processing System** is a type of information system that collects, stores, modifies and retrieves the day-to-day data transactions of an enterprise.
2. TPS is also known as transaction processing or real time processing.
3. TPS characteristics include Consistency, Reliability and Performance.
4. Some Standard examples of transaction processing systems would be the one used in Airline Reservation Systems, Railway reservation on by IRCTC, Banking Systems, or the Accounting system etc.
5. TPS systems are designed to process transactions instantaneously to ensure that customer data is available to the processes that require it.

Typical Transaction Processing Cycle:

1. **Data Entry:**
 - a) The first step of the transaction processing cycle is the capture of business data.
 - b) For example, transaction data may be collected by point-of-sale terminals using optical scanning of bar codes and credit card readers at a retail store or other business.
 - c) *The recording and editing of data has to be quickly and correctly captured for its proper processing.*
2. **Transaction Processing:** Transaction processing systems process data in two basic ways: Batch processing & Real-time processing (also called online processing)
3. **Database Maintenance:**
 - a) An organization's databases must be updated by its transaction processing systems so that they are always correct and up-to-date.

- b) For example, database maintenance ensures that changes are reflected in the data records stored in the company's databases.

4. Document and Report Generation:

- a) Transaction Processing Systems produce a variety of documents and reports.
- b) Examples of transaction documents include purchase orders, paychecks, sales receipts, invoices, and customer statements.

TPS Attributes:

1. **Access Control:** Access controls do not allow people who are not authorized to use the system are not permissible to influence or transform the transaction process.
2. **Equivalence:** TPS transactions are processed in the same format every time to ensure that full effectiveness is achieved.
3. **High Volume Rapid Processing:** TPS is designed to process large volumes of transactions in an instantaneous manner.
4. **Trustworthiness:** A TPS is designed to be robust and trustworthy. The system is capable to process transactions very rapidly at the same time it preserves the integrity of data.

5. What are Transactions Processing Qualifiers? (PM, M15 - 4M, RTPN15, N14 MTP1 - 2M)

1. In order to qualify as a TPS, transactions made by the system must pass ACID test.
2. These four conditions ensure that TPS systems perform their transactions in a systematic, standardized and reliable manner.
3. **Transaction Processing Qualifiers:**
 - a) **Atomicity:** This means that a transaction is either completed in full or not at all. TPS systems ensure that transactions take place in their entirety.
 - b) **Consistency:** TPS systems exist within a set of operating rules or integrity constraints. If an integrity constraint states that all transactions in a database must have a positive value, any transaction with a negative value would be refused.
 - c) **Isolation:** Transactions must appear to take place in isolation or individual. For example, when a fund transfer is made between two accounts the debiting of one and the crediting of another must appear to take place simultaneously.
 - d) **Durability:** Once transactions are completed they cannot be undone. To ensure that this is the case even if the TPS suffers failure, a log will be created to document all completed transactions.

6. What is Management Information System (MIS)? (PM)

1. 'Management Information System' (MIS) refers to the data, equipment and computer programs that are used to develop information for managerial use.
2. Management Information System is an integrated, user-machine system for providing information to support operation, management and decision-making functions in an organization.
3. Management Information System is a system which provides accurate, timely and meaningful data for management planning, analysis and control to optimize the growth of the organization.
4. MIS is the management of information systems.
5. **MIS is an Integrated Application: (N15 MTP1-2M)**
 - a) MIS is an integrated information system that serves all departments within an enterprise.
 - b) MIS implies the use of packaged software rather than proprietary software.
 - c) MIS solutions are accessible via web browsers of internet.
 - d) *Integrated MIS system should follow the following steps:*
 - i) *Groundwork examination*

- ii) Requirement analysis
- iii) Systems blueprint/Design
- iv) Acquisition/ procurement

6. **Developing MIS – Dos And Don'ts:** Once we are in the process of developing MIS or rather make up our mind to implement MIS, the best way is to accomplish some homework which can facilitate in finding out what is right and what is wrong.

DEVELOPING MIS – DO'S AND DON'TS

No.	Particular	Do's	Don't
1.	Layman	Have simpler and manageable system	Be ambitious
2.	Bridging	Develop common understanding between consultant and the organization	Be unrealistic in developing action plan
3.	Contribution in Totality	Involve programmer in needs assessment	Delay decisions on hiring application developer/s
4.	Tailor-made	Customize software	Depend heavily on the Consultant
5.	Interpretation	Have simple software for users to handle	Invest heavily in in-house application development
6.	Synchronization	Extensively involve users in MIS development	let vendors determine hardware needs of LAN
7.	Application	Adopt modular approach for s/w development	Go for large applications

Examples of MIS:

1. Airline reservations - seat, booking, payment, schedules, boarding list, special needs, etc.
2. Bank operations - Deposit, transfer, withdrawal etc. electronically with a distinguish payment gateways
3. Integration of department with the help of software's like ERP
4. Logistics management application to streamline the transportation system
5. Train reservation with the help of IRCTC.

7. What is meant by Decision Support System? Explain characteristics of a Decision Support System. (PM, N15 - 2M, N14 MTP1 - 1M)

- a) DSS's are information processing systems frequently used by accountants, managers and auditors to assist them for decision-making purposes.
- b) A Decision Support System (DSS) is a computer-based information system that supports business or organizational decision-making activities.
- c) DSS can be extremely beneficial to any organization's overall performance.
- d) Decision Support System (DSS) covers a wide variety of systems, tools and technologies.
- e) DSS helps users to:
 - i) Produce data models and "what if" scenarios
 - ii) Manipulate data directly
 - iii) Premeditated to make non-routine decision.
 - iv) Slot in data from external sources.

Characteristic features:

- a) **DSS supports management decision making:** Generally these systems are used by top level management for decision making purposes. These are also used by operational managers for management planning decisions. DSS enhances the quality of decisions.

- b) **Decision support systems solve unstructured problems:** Problems that do not have easy solutions and problems in which some managerial judgment is necessary are called unstructured problems and such problems can be easily solved by DSS.
- c) **Friendly computer interface:** Generally Decision Support Systems are operated by managers and other decision makers, who are non-programmers. So these systems must be easy to use.

8. What are the components of a Decision Support System? (PM, N15 - 4M, N14 MTP1 - 4M)

1. Users:

- a) Usually, the user of a DSS is a manager with some unstructured or semi-structured problem. The manager may be at any level of authority in the organization (e.g. either top level or middle level or bottom level managers).
- b) Generally, users do not need computer knowledge to use a Decision Support System.

2. Databases:

- a) Decision Support Systems include one or more databases.
- b) These databases contain both routine and non-routine data from both internal and external sources.

3. Planning languages: Planning languages can be either general-purpose or special-purpose, allowing users to perform routine tasks and specific tasks respectively.

- a) **General Purpose Planning languages:** These allow users to perform many routine tasks, retrieving various data from a database or performing statistical analyses. These languages enable user to tackle a broad range of budgeting, forecasting and other worksheet-oriented problems. Examples are Electronic spreadsheets. **(PM, MTP - MAY 16)**
- b) **Special Purpose Planning languages:** These are more limited in what they can do, but they usually do certain jobs better than the general purpose planning languages. Some of the statistical languages such as SAS and SPSS are examples. **(PM, MTP-MAY 16)**

4. Model base:

- a) It is the "brain" of the Decision Support System.
- b) It processes data with the help of data provided by the user and the database.
- c) There are many types of model bases, but most of them are custom developed models.
- d) The analysis provided by model base is the key for user's decision.

9. What are the Benefits of DSS?

1. Improved decision quality
2. Cost reduction
3. Increased productivity
4. Improved communication
5. Time saving
6. Improved customer satisfaction

10. Write a short note on Executive Information Systems? Explain the EIS components. (PM, M15RTP)

1. *An Executive Information System (EIS) is a DSS that is designed to meet the special needs of top-level managers.*
2. It is a tool that provides direct on-line access to relevant information in a useful and navigable format.

3. An EIS normally features graphical displays on an easy to use interface.
4. EIS can be used in many different types of organizations to monitor enterprise performance as to identify opportunities and problems.
5. EIS provides rapid access to timely information and direct access to management reports.
6. EIS is capable of accessing both internal and external data to provide the amount and kind of information executives find useful.
7. EIS provides extensive online analysis tool like trend analysis, market conditions etc.
8. Alternative names for EIS are Enterprise Information System or Executive Support Systems (ESS).

Components:

(NOV16 -2M)

- a) **Hardware:** Includes Input data-entry devices, CPU, Data Storage files and Output Devices.
- b) **Software:** Includes Text based software, Database, and Graphic types such as time series charts, scatter diagrams, maps, motion graphics, sequence charts, and bar charts.
- c) **User Interface:** Includes hardware and software components by which users interact with a machine. Several types of interfaces can be available to the EIS structure, such as menu driven, command language, natural language, and input/output.
- d) **Telecommunication:** Involves transmitting data from one place to another in a reliable networked system.

11.

What do you mean by Office Automation Systems (OAS)? Explain benefits and examples of Office Automation system. (PM)

1. Office automation always implies a network of computers with a variety of available programs.
2. Office Automation refers to the entire tools and methods that are applied to office activities which formulate to practice written, visual, and sound data in a computer-aided mode.
3. The Office Automation Systems (OAS) is amalgamation of hardware, software, and other resources used to smoothen the progress of communications and augment efficiency.
4. Office automation refers to the use of computer and software to generate, collect, store, manipulate, and relay office information needed for accomplishing basic tasks and goals.
5. OAS uses new technologies to get a better working environment.
6. *Office Automation is a widespread appearance that includes an all - embracing variety of applications of computer, communication and information technologies in office surroundings.*
7. In meticulous, it in addition comprises the following activities:
 - i) Exchange of information;
 - ii) Management of administrative documents;
 - iii) Handling of numerical data
 - iv) Meeting, planning and management of work schedules.
8. **Benefits:**
 - a) Improves communication within and between organizations.
 - b) Accuracy of Communication.
 - c) Reduces the cost of communication.
 - d) Reduces the time.

Examples of Office Automation Systems:**(M15 MTP2 - 4M)**

Application	Description
Word Processing	Use of a computer to perform automatically many of the tasks necessary to prepare typed or printed documents.
Electronic mail	Use of a computer network that allows users to send, store and retrieve messages using terminals and storage devices.
Voice Mail	Requires computers with an ability to store audio messages digitally and convert them back upon retrieval.
Electronic Calendaring	Use of a networked computer to store and retrieve a manager's appointment calendar. Allows other managers' calendars to be accessed and facilitates scheduling.
Video Conferencing	Use of television equipment to link geographically dispersed conference participants.
Desktop Video Conferencing	Video and audio equipment are attached to each workstation in the network enabling the two-way communication of picture and way communication of picture and sound.
FAX	Uses special equipment that can read a document at one end of a communication channel and make a copy at the other end.
Imaging	Uses Optical Character Recognition (OCR) to convert data on paper to a digital format for storage in a secondary storage device.
Desktop Publishing	Uses a computer to prepare output that is very close in quality to that produced by a typesetter.

12.**Explain Knowledge Management System (KMS).****(PM, N14 RTP, M15 MTP1-1M, N15 MTP2-4M)**

1. Knowledge Management Systems refers to system that stores and retrieves knowledge, improves collaboration, locates knowledge sources, mines repositories for hidden knowledge, captures and uses knowledge.
2. *The idea of a KM system is to enable employees to have ready access to the organizations documented base of facts, sources of information and solutions.*
3. KMS treats the knowledge component of any organization's activities as an explicit concern reflected in strategy, policy, and practice at all levels of the organization.
4. KMS makes a direct connection between an organization's intellectual assets — both explicit [recorded] and tacit [personal know-how] — and positive results.
5. There are two broad types of knowledge—**Explicit** and **Tacit**.

(Differentiate between Explicit and Tacit Knowledge) (M15-4M, M15 MTP2-4M)

- a) **Explicit knowledge:** Explicit knowledge is that which can be formalized easily and as a consequence is easily available across the organization. For example – Online tutorials, Policy and procedural manuals.
 - b) **Tacit knowledge:** Tacit knowledge is unarticulated and represented as intuition, perspective, beliefs, and values that individuals form based on their experiences. For example – hand-on skills, special know-how, employee experiences.
6. Knowledge base is a special kind of database for knowledge management. It is an information repository that provides a means for information to be collected, organized, shared, searched and utilized. It can be either machine-readable or intended for human use.

13. Write about Knowledge Discovery and Data Mining (KDD).

1. Knowledge Discovery and Data Mining (KDD) deals with ways and means of capturing and making obtainable knowledge of the experts to others in electronic form.
2. Knowledge Discovery in Databases systems also assist us to establish, contact, and communicate with experts on various subjects, present in our organization, or perhaps even outside.
3. Knowledge worker is a key intellect who is employed owing to his or her acquaintance of a subject matter, rather than their ability to perform manual labor.
4. It includes those in the information technology fields, such as computer programmers, systems analysts, technical writers or the people outside of information technology.
5. There are confident factors that show “why knowledge has gained so much momentum in recent times”. These are:
 - a) **Altering Business surroundings:** Previously the business environment used to be stable one, so the people of any organization naturally became knowledgeable over time. *They absorbed and hang out knowledge about company's product & service, its market, customers, competitors and suppliers. But now rapid change means speedy knowledge obsolescence, so need is there to manage it before it disappears without leaving a trace.*
 - b) **Burgeon Connections:** Extremely dispersed operations, global expansion, continual change – none of these would have been possible if it was not possible to deploy knowledge officially and deliberately. *Cheap computing has made it probable. IT is now translucent to the user and is more accomplished of capturing knowledge. The authentic, interactive networks can put knowledgeable people in stroke through communication & technologies.*
 - c) **Globalization:** It's putting heaviness on firms for innovation as markets are at the present release for new-fangled players and competition is stiff. The scenery of goods and services has changed. Now companies have started selling knowledge in addition. *For a research lab or software firm, not managing knowledge is similar to WalMart not managing inventory.*
 - d) **Modification in Organizational composition:** In today's state of affairs, the organizational structures are changing. The new arrangement is that of “Virtual Organization”. This composition is used to integrate far flung operations & Knowledge Discovery in Databases is required.

14. Write a short note on Specialized Systems.

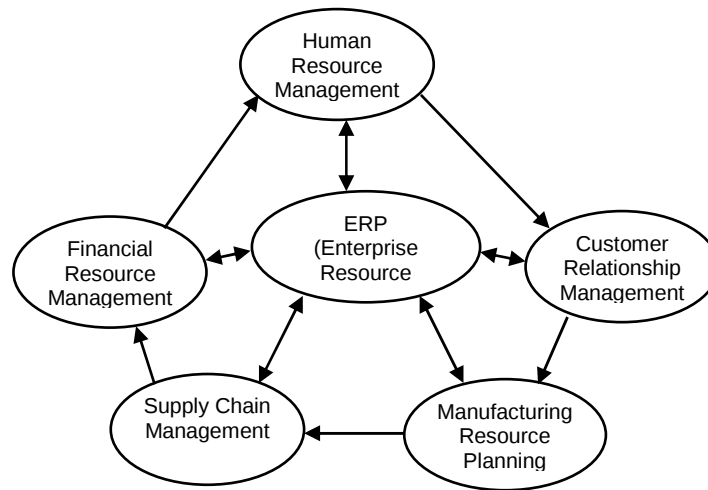
(M15 MTP2 - 1M, N14 MTP1 - 1M)

1. Specialized Systems provide comprehensive end to end IT solutions and services to various organizations.
2. There are various specialized systems. Some of them are:
 - a) ERP
 - b) CRM
 - c) SCM

15. Explain Enterprise Resource Planning (ERP).

(PM)

1. An Enterprise Resource Planning (ERP) system is fully integrate internal and external management information across entire organization, covering functional areas of an enterprise like Procurement, Inventory, Production, Sales, Logistics, Finance, Accounting and Human Resources.
2. “Enterprise Resource Planning has become a powerful tool in the hands of management for effective use of resources and to improve efficiency of an enterprise”



ERP linkages with various Modules

3. It organizes and integrates operation processes and information flows to make optimum use of resources such as men, material, money and machine, i.e. ERP is the way an Enterprise plans the optimum use of its resources.
4. ERP promises one database, one application, and one user interface for the entire enterprise.
5. The basis of ERP is to make easy flow of information among all business functions in the internal boundaries of the organization and control the connections to external stakeholders.
6. ERP software provides competent and efficient administration, and mechanized business activities.
7. It is a complete software solution package for enhancing the performance in large organizations and meeting their requirements with ease and efficiency.

16. Define the term CRM. Explain CRM Architecture.

(PM)

1. Customer Relationship Management (CRM) may be defined as a business process in which client relationships; customer loyalty and brand value are built through marketing strategies and activities.
2. The general purpose of CRM is to help organizations in managing their customers in a better way through the introduction of reliable systems, processes and procedures.
3. CRM allows businesses to develop long-term relationships with established and new customers, while helping to modernize corporate performance.
4. CRM incorporates commercial and client-specific strategies via employee training, marketing planning, relationship building and advertising.
5. The main objective is to retain as much loyal customers.
6. Additionally, loyalty is desired first and foremost in a precise category of the client base. If we go into the depth of the research and studies that shows another expression of the **old Pareto Rule "80/20 rule"** which emphasize that most organizations find that approximately 20% of their customer base generates 80% of the profits. It is merely based on the philosophy that indicates that old trustworthy customers are most lucrative and helps in generating profits. **(N15 MTP1-2M)**
7. A good CRM program needs to:
 - a) Identify customer success factors,
 - b) Create a customer-based culture,
 - c) Adopt customer-based measures,
 - d) Develop an end-to-end process to serve customers,
 - e) Recommend the questions to be asked to help a customer to solve a problem,
 - f) Recommend what to tell a customer with some complaint,
 - g) Track all aspects of selling to customers.

8. Architecture of CRM:

- a) **Operational:** Automation is provided to the basic business processes like marketing, sales, service, etc.
- b) **Analytical:** Helps to analyze customer behavior, implements business intelligence like technology, etc.
- c) **Collaborative:** Ensures contact with customers like phone, email, fax, web, SMS, post, in person, etc.

17. Define Supply Chain Management.**(N14 MTP2 - 1M)**

1. Supply Chain Management (SCM) is the process of planning, implementing and controlling the operations of the supply chain with the purpose to satisfy customer requirements in an efficient way.
2. Supply Chain Management covers all movements and storage of raw materials, work-in-process, and finished goods from point-of-origin to point-of-consumption.
3. Supply Chain Management integrates supply and demand management, within and across companies.
4. SCM is a chain that starts with customers and ends with customers.
5. SCM is based on two central ideas.
 - a) The first is that practically every product that reaches an end user represents the cumulative effort of multiple organizations. These organizations are referred to collectively as the Supply Chain.
 - b) The second thought is that while supply chains have existed for a long time, most organizations have only paid attention to what was happening within their “four walls.”

18. Explain the components of Supply Chain Management. (M15RTP, N15RTP, N14 MTP2 - 3M)

1. **Procurement/Purchasing:**
 - a) It begins with the purchasing of parts, components, or services. Procurement must ensure that the right items are delivered in the exact quantities at the correct location on the specified time schedule at minimal cost.
 - b) The key issue in procurement is how one goes about selecting and maintaining a supplier, which can be approached from two directions.
 - c) The first concentrates on how a firm might evaluate a potential supplier whereas the second is how a firm evaluates those businesses that are already suppliers to an operation.
2. **Operations:** Having received raw materials, parts, components, assemblies, or services from suppliers, the firm must transform them and produce the products or the services that meet the needs of its consumers.
3. **Distribution:** Distribution involves several activities—transportation (logistics), warehousing, and Customer Relationship Management (CRM).
4. **Integration:** The last element of Supply Chain Management is the need for integration. It is critical that all participants in the service chain recognize the entirety of the service chain.

19.**Explain Human Resource Management Systems? Explain key integration points and benefits. (N15 MTP1 - 2M)**

1. A Human Resources Management System (HRMS) is a software application that coalesce many human resources functions, together with benefits administration, payroll, recruiting and training, and performance analysis and assessment into one parcel.
2. *HRMS or Human Resources Information System (HRIS) refers to the systems and processes at the intersection between Human Resource Management (HRM) and Information Technology.*

3. **Key Integration Points:** HRMS uniquely provides indigenous integrations from HR Management to other core talent management processes in order to support a holistic, end-to-end cloud talent management strategy. **Benefits:**
- Bringing industry best practices to the HR functions
 - HRMS lets you assess and utilize the human resource potential completely.
 - The solution increases the operational efficiency and productivity of the HR department.
 - Reduces HR administrative costs.
 - Increases employee engagement and satisfaction.
 - Improves leadership development and succession
 - Enhances data integrity within the enterprise
 - Enable to meet compliance and audit requirement.

20. Explain key modules in HRMS

(PM, N15 MTP2 - 4M)

- Workforce Management:** Integrated across the strategic Human Capital Management (HCM) solution; Workforce Management provides powerful tools to effectively manage labour rules, ensure compliance, and control labour costs and expenses.
- Time and Attendance Management:** The time and attendance module gathers standardized time and work related efforts.
- Payroll Management:** This module of the system is designed to automate manual payroll functions and facilitate salary, deductions, calculations etc.; eliminates errors and free up HR staff for more productive tasks.
- Training Management:** The module tracks the trainer or training organization; costs associated with training schedules, tracks training locations, required supplies and equipment and registered attendees.
- Compensation Management:** Compensation Management is to attract and retain talented employees.
- Recruitment Management:** This module helps in hiring the right people with the right target skills. This module includes processes for managing open positions/requisitions, applicant screening, assessments, selection and hiring, correspondence, reporting and cost analysis.
- Personnel Management:** The personnel management module comprises of HR master data, personnel administration, recruitment and salary administration.
- Organizational Management:** Organizational Management module includes organizational structure, staffing schedules and job description.
- Employee Self Service (ESS):**
 - The Employee Self Service module allows employees to query HR related data and perform some Human Resource transactions over the system.
 - For example - Employees may query their attendance record from the system without asking the information from HR personnel.
- Analytics:** The Analytics module enables organizations to extend the value of an HRMS implementation by extracting HR related data for use with other business intelligence platforms.

21. Write about Core Banking System (CBS).

(PM, N15 - 2M, M15 MTP1 - 2M)

- CORE** stands for "Centralized Online Real-time Environment".
- Core banking systems are the heart of a bank. The absolute bank's branches access applications from centralized data centers.
- Core Banking System may be defined as the set of basic software components that manage the services provided by a bank to its customers through its branches.

4. In other words, the platform where communication technology and information technology are merged to suit core needs of banking is known as Core Banking Solutions (CBS).
5. Normal core banking functions will include deposit accounts, loans, mortgages and payments. Banks make these services available across multiple channels like ATMs, Internet banking, and branches.
6. The various elements of core banking include:
 - a) Making and servicing loans
 - b) Opening new accounts
 - c) Processing cash deposits and withdrawals
 - d) Processing payments and cheques
 - e) Calculating interest
 - f) CRM activities
 - g) Managing customer accounts
 - h) Establishing interest rates
 - i) Maintaining records for all the bank's transactions.
7. Examples of major core banking products include Infosys' Finacle, Nucleus FinnOne and Oracle's Flex cube application.

22.

What is Accounting Information System (AIS)? Explain key components of Accounting Information System. (PM, M15 - 4M)

1. Accounting Information System is defined as a system of collection, storage and processing of financial and accounting data that is used by decision makers.
2. An accounting information system is generally a computer-based method for tracking accounting activity in combination with information technology resources.
3. The resulting statistical reports can be used internally by management or externally by other interested parties including investors, creditors and tax authorities.
4. **Key components/elements of Accounting Information System:**
 - a) **People:**
 - i) AIS helps various system users that include accountants, consultants, business analysts, managers, chief financial officers and auditors etc. from different departments within a company to work together.
 - ii) With well-designed AIS, everyone within an organization who is authorized to do so can access the same system and get the same information.
 - b) **Procedure and Instructions:** These include both manual and automated methods for collecting, storing, retrieving and processing data.
 - c) **Data:**
 - i) It refers to the information relevant to the organization's business practices that may include sales orders, customer billing statements, sales analysis reports, general ledger, inventory data, payroll information, tax information etc.
 - ii) This data can be used to prepare accounting statements and reports.
 - d) **Software:** These are the computer programs that provide quality, reliability and security to the company's financial data that may be stored, retrieved, processed and analyzed.
 - e) **Information Technology Infrastructure:**
 - i) This include hardware such as personal computers, servers, printers, surge protectors, routers, storage media, and possibly a backup power supply used to operate the system.
 - ii) The hardware selected for AIS must be compatible with the intended software.

f) Internal Controls:

- i) These are the security measures such as passwords or as complex as biometric identification to protect sensitive data against unauthorized computer access and to limit access to authorized users.
- ii) Internal controls also protect against computer viruses, hackers and other internal and external threats to network security.

23.

Define the term Artificial Intelligence? Write some commercial applications of AI?

(PM, N14- RTP, M15 MTP2-1M)

1. Artificial Intelligence (AI) is the distinct area of computer science focusing on creating machines that tries to imitate aspects of human behavior, such as to reason, communicate, see, and hear.
2. The decisive objective of AI is to make a computer that can discover, sketch, and crack problems in parallel.
3. AI software can use its accumulated knowledge to reason and in some instances learn from experience and thereby modify its subsequent behavior.
4. Artificial intelligence is manmade and its level of activity depends on the programming capability.
5. It is mechanism that is not subject to human feelings like fatigue, worry, etc.
6. The subject of artificial intelligence spans a wide horizon (distance) dealing with various kinds of knowledge representation schemes, different techniques of intelligent search, various methods for resolving uncertainty of data and knowledge, different schemes for automated machine learning and many others.
7. Expert systems, Pattern recognition, Natural language processing, and many others are some of the various purposes on which AI may be applied.

8. Commercial Applications of AI:

(N15MTP1 - 3M)

a) Decision Support:

- i) Intelligent work environment that will help you capture the “why” as well as the “what” of engineered design and decision making.
- ii) Intelligent human-computer interface (HCI) systems that can understand spoken language and gestures, and facilitate problem solving by supporting organization wide collaborations to solve particular problems.
- iii) Situation assessment and resource allocation software for uses that range from airlines and airports to logistics centers.

b) Information Retrieval

- i) AI-based Intranet and Internet systems that distill tidal waves of information into simple presentations.
- ii) Natural language technology to retrieve any sort of online information, from text to pictures, videos, maps, and audio clips, in response to English questions.
- iii) Database mining for marketing trend analysis, financial forecasting, and maintenance cost reduction, and more.

c) Virtual Reality

- i) X-ray-like vision enabled by enhanced-reality visualization that allows brain surgeons to “see through” intervening tissue to operate, monitor, and evaluate disease progression.
- ii) Automated animation interfaces that allow users to interact with virtual objects via touch (e.g., medical students can “feel” what it’s like to stitch severed aortas/veins).

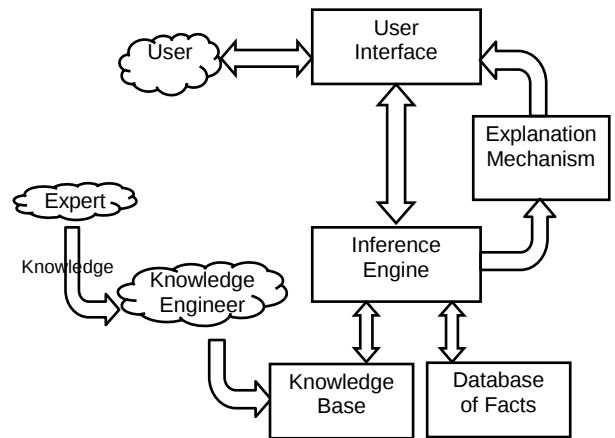
d) Robotics

- i) Machine-vision inspections systems for gauging, guiding, identifying, and inspecting products and providing competitive advantage in manufacturing.
- ii) Cutting-edge robotics systems, from micro-robots and hands and legs.

24.

Write a short note on Expert Systems. Explain various elements of expert systems.**(PM, N14 RTP)**

1. An expert system (ES) is a computerized information system that allows non-experts to make decisions comparable to that of an expert.
2. Expert systems are used for complex or unstructured tasks that require experience and specialized knowledge.
3. The aim of the expert system is to have a team of experienced specialists holding industry-wide experience who further spread across implementations.
4. Expert system utilizes its strength to plan and execute a miscellaneous variety of projects for Defense, Government, Finance, Telecom, and Engineering sectors.



Expert systems typically contain the following components:

(N15 - 4M, M15 MTP1 - 5M)

1. **User interface:** This program allows the user to design, create, update, use and communicate with the expert system.
2. **Inference engine:** This program consists of logic and reasoning mechanism that can simulate the expert's logic process and deliver advice. It uses data obtained from both knowledge base and the user to make associations and inferences, form conclusions and recommend a course of action.

(N15RTP)

3. **Knowledge base:**

- a) This includes data, knowledge, relationships, rules of thumb (heuristics) and decision rules used by experts to solve a particular type of problem.
 - b) A knowledge base in a computer is equal to the knowledge of an expert or group of experts developed through years of experience in their field.
 - c) The knowledge base of expert systems encloses both realistic and heuristic knowledge.
 - d) Realistic knowledge is that knowledge of the job domain that is extensively shared, characteristically found in textbooks or journals, and frequently agreed upon by those knowledgeable in the meticulous field whereas Heuristic knowledge is the fewer rigorous, extra empirical, supplementary judgmental knowledge of performance.
4. **Explanation facility:** With the help of this facility a user can know the logic being followed by the expert system to arrive at the conclusion.
 5. **Knowledge acquisition facility:** Building a knowledge base, known as knowledge engineering, involves both human expert and a knowledge engineer. The knowledge engineer extracts an individual's expertise and uses the knowledge acquisition facility to enter it into knowledge base.
 6. **Database of Facts:** This holds the user's input about the current problem. The user may begin by entering as much as they know about the problem or the inference engine may prompt for details or ask whether certain conditions exist. Gradually a database of facts is built up which the inference engine will use to come to a decision. The quality and quantity of data gained from the user will influence the reliability of the decision.

25.

What are the advantages and disadvantages of Expert Systems?

Advantages:

1. They provide a cost-effective alternative to human experts.
2. They can outperform a single expert because their knowledge is gained from several experts.

3. They are faster and do not get over worked or stressed out.
4. They produce better-quality and more consistent decisions. *Expert systems assist users in identifying problems, which increases the probability of making sound decisions.*
5. They can increase productivity.
6. They preserve the expertise of an expert, leaving the organization.

Limitations:

1. Development can be costly and time-consuming. Some large systems require upto 15 years and millions of dollars to develop.
2. It is difficult to obtain knowledge from experts because it is very difficult to specify exactly how the decision maker has taken decision.
3. Designers were unable to program human being's common sense into current systems. If the system faces any situation, which is not programmed to handle, then the system may break down.

26.

What are various Business Intelligence tools?

(N14RTP, M15RTP, N15RTP, N14 MTP2 - 4M)

1. Business Intelligence tools are a type of software that is designed to retrieve, analyze and report data.
2. *BI is basically just getting important business information to decision makers when they need it – in a way that they can actually use it.*
3. BI tools are standalone tools or suites of tools that are targeted to a specific industry that implement a particular BI technique.
4. Business Intelligence tools are software programs and features that are used to complete detailed data analysis.
5. There are different types of business intelligence tools which a business may need in order to achieve business objectives.
6. Some of the key Business Intelligence tools are:

- a) **Simple Reporting and Querying:** This involves using the data warehouse to get response to the query: "Tell me what happened." The objective of a BI implementation is to turn operational data into meaningful knowledge.

There are used to arrange information into a readable format and distribute it to the people who need it

- b) **Business Analysis [BA]:** This involves using the data to get response to the query: "Tell me what happened and why." Business analysis refers to presenting visualizing data in a multidimensional manner.

ETL (Extract, Transform, and Load) tools bring in data from outside sources, transform it to meet business specified operational needs, and then load the results into the company database.

- c) **Dashboards:** This involves using the information gathered from the data warehouse and making it available to users as snapshots of many different things: "Tell me a lot of things, but without too much effort".

(N14 MTP1-1M, NOV16 -2M)

Dashboards are flexible tools that can be bent into as many different shapes as per user requirements.

- d) **Scorecards:** Scorecards distil information into a small number of metrics and targets and provide users with an at-a-glance perspective of information.

A scorecard has a graphical list of specific, attainable strategic milestones, combined with metrics that serve as benchmarks.

(M15 MTP2 - 2M, NOV16 -2M)

- e) **Data Mining or Statistical Data Analysis:** This involves using statistical, artificial intelligence, and related techniques to mine through large volumes of data and providing knowledge without users even having to ask specific questions.

Data Mining involves data analysis for discovering useful patterns that are "hidden" in large volume of diverse data.

27. Explain the importance of access and privilege controls.

(N14 MTP2 - 1M)

1. Access controls help us to restrict whom and what accesses our information resources, and they possess four general functions: identity verification, authentication, authorization, and accountability.
2. These functions work together to grant access to resources and limit what a subject can do with them. These are:
 - a) **Identity Management:** Identity Management consists of one or more processes to verify the identity of a subject attempting to access an object. Identity Management includes assigning and managing a subject's identity. However, it does not provide 100 percent assurance of the subject's identity. Rather, it provides a level of probability of assurance.
 - b) **Authentication:** Authentication is the process of verifying a subject's identity at the point of object access.
 - c) **Authorization:** Authorization identifies what systems, network resources, etc. a subject can access.
 - d) **Accountability:** Each step from identity presentation through authentication and authorization is logged. The logs are stored for audits. They provide insight into how well the access control process is working or not.

28. What are various approaches to access control and principle of least privilege? (Or) Briefly explain the two main approaches to establish access controls in software systems.

(PM, N14 - 4M)

There are two major approaches to establish access controls:

- a) **Role-based Access Control (RBAC):** RBAC largely eliminates discretion when providing access to objects. Instead, administrators or automated systems place subjects into roles.
Subjects receive only the rights and permissions assigned to those roles. When an employee changes jobs, all previous access is removed, and the rights and permissions of the new role are assigned. RBAC enforces static constraints based on a user's role.
- b) **Rules-based Access Control (RAC):** RAC takes into account the data affected, the identity attempting to perform a task, and other triggers governed by business rules.
RAC uses specific rules that indicate what can and cannot happen between a subject and an object. A manager, for example, has the ability to approve his/her employees' hours worked. Note that this is dynamic and occurs at the time a transaction is attempted. This also sometimes called dynamic RBAC.

29. Write about credit card. What are the steps involved in credit card transaction?

(PM, N14 MTP1 - 4M)

Credit Cards:

1. In a credit card transaction, the consumer presents preliminary proof of his ability to pay by presenting his credit card number to the merchant.
2. The merchant can verify this with the bank and create a purchase slip for the consumer to endorse.
3. The merchant then uses this purchase slip to collect funds from the bank, and, on the next billing cycle, the consumer receives a statement from the bank with a record of the transaction.

How a credit card is processed?

Step 1: Authorization: This is the first step in processing a credit card. After a merchant swipes the card, the data is submitted to merchant's bank, called an acquirer, to request authorization for the sale. *The acquirer then routes the request to the card issuing bank, where it is authorized or denied, and the merchant is allowed to process the sale.*

(N15 MTP2 - 2M)

Step 2: Batching: This is the second step in processing a credit card. At the end of the day, the merchant reviews all the day's sales to ensure that all of them were authorized and signed by the cardholder. It then transmits all the sales at once, called a batch, to the acquirer to receive payment.

Step 3: Clearing: This is the third step in processing a credit card. After the acquirer receives the batch, it sends it through the card network, where each sale is routed to the appropriate issuing bank. The issuing bank then subtracts its interchange fees, which are shared with the card network and transfers the remaining amount through the network, back to the acquirer.

Step 4: Funding: This is the fourth and final step in processing a credit card. After receiving payment from the issuer, minus interchange fees, the acquirer subtracts its discount fee and sends the remainder to the merchant. The merchant is now paid for the transaction, and the cardholder is billed.

30. Write about electronic cheques.

(PM, N14 - 2M)

1. An electronic cheque has all the features as a paper cheque.
2. It acts as a message to the sender's bank to transfer funds.
3. Like a paper cheque, the message is first given to the receiver, who, in turn, endorses the cheque and presents it to the bank to obtain funds.
4. *The electronic cheque can prove to be superior to the paper cheque in one significant aspect. The sender can protect himself against fraud by encoding the account number with the bank's public key. Thus it is not necessary to reveal the account number to the merchant.*
5. *Similar to SET protocol, digital certificates can be used to authenticate the payer, the payer's bank, and the bank account.*
6. Credit card payments will undoubtedly be popular for commerce on the Internet. However, following 2 systems have been developed to use electronic cheques to pay Web merchants directly.

a) Financial Services Technology Corporation (FSTC):

- i) The FSTC is a consortium of banks and clearing houses that has designed an electronic cheque.
- ii) Designed in the lines of traditional paper cheque, this new cheque is initiated electronically.
- iii) It uses digital signature for signing and endorsing.

b) Cyber Cash:

- i) This is an extension of wallet for credit cards, and it can be used in the same way to make payments with participating vendors.
- ii) Cyber Cash will not serve as an intermediate party for processing the cheque. That function will be handled directly by banks.

31.

Define smart cards. Write about different types of smart cards available.

(PM, N15 RTP, N14 MTP2 - 1M, M15 MTP1 - 3M)

1. Smart Cards:

- a) Smart cards have an embedded microchip instead of magnetic strip.
- b) The chip contains all the information a magnetic strip contains but offers the possibility of manipulating the data and executing applications on the card.

2. Types of smart cards:

Three types of smart cards have established themselves.

- a) **Contact Cards:** Smart cards that need to insert into a reader in order to work, such as a Smart Card Reader or Automatic Teller Machines.

- b) **Contactless Cards:** Contact less smart card doesn't need to be inserted into a reader. Just waving them near a reader is just sufficient for the card to exchange data. This type of cards is used for opening doors.
- c) **Combi / Hybrid Cards:** Combi cards contain both technologies and allow a wider range of applications.

32. Write about Electronic purses.

(PM, M15 - 2M)

1. Electronic purse is yet another way to make payments over the internet.
2. It is very similar to a pre paid card.
3. For E.g. Bank issues a stored value cards to its customers. Customer can then transfer value from their accounts to the cards at an ATM, a personal computer, or a specially equipped telephone. The electronic purse card can be used as an ATM card as well as a credit card.
4. While making purchases, customers pass their cards through a vendor's point of sale terminal.
5. No credit check or signature is needed.
6. Validation is done through a Personal Identification Number (PIN)
7. Once the transaction is complete, funds are deducted directly from the card and transferred to the vendor's terminal.
8. *Merchants can transfer the value of accumulated transactions to their bank accounts by telephone, as frequently as they choose.*
9. *When the value on a card is spent, consumers can load additional funds from their accounts to the card.*

4. BUSINESS PROCESS AUTOMATION THROUGH APPLICATION SOFTWARE

1. What are Business Applications and its types?

1. Business is defined as a person's regular occupation or commercial activity, a person's concern.
2. Application is defined as a computer program to fulfill a particular purpose.
3. Business Application is a program used to fulfill a person's need for regular work or commercial activity. **(M15 MTP1 - 1M)**
4. *A business application is a program or a set of programs used by business people.*

Classification of Business Applications

Types	Nature of Processing	Source of Application	Nature of Business	Nature of applications
Type I	Batch Processing	In-house Developed	Small business	Accounting Application
Type II	Online Processing	Purchased Application	Medium Business	Cash Management
Type III	Real-time Processing	Leased	Large business	Manufacturing Applications
More types	No	Yes	No	Yes

2. What are the applications based on nature of processing?

1. **Batch Processing:**
 - a) It is defined as a processing of large set of data in a specific way, automatically, without any need of any user intervention.

- b) The data is first collected, and then batch-processed, so all the collected data is processed in one step.
- c) Batched jobs can take a long time to process.
- d) Batch processing is used in producing bills, stock control, producing monthly credit card statements, etc

2. **Online / Interactive Processing:**

- a) Data is processed immediately while it is entered, the user usually only has to wait a short time for a response. (Example: games, word processing, booking systems).
- b) Interactive or online processing requires a user to supply an input.
- c) It enables the user to input data and get the results of the processing of that data immediately. **(N15 - 1M)**

3. **Real-time Processing:**

(N15 - 1M, N15 MTP1 - 2M)

- a) Real time processing is a subset of interactive or online processing. Input is continuously, automatically acquired from sensors, which is processed immediately in order to respond to the input in as little time as possible.
- b) After the system finishes responding, it reads the next set of input data immediately to process that.
- c) This system doesn't need a user to control it, it works automatically.
- d) Real time processing is used in warning systems on aircraft, alarm systems in hazardous zones, burglar alarms etc.

3. **Explain the Business applications based on nature of application?**

1. A business application may also be classified based on business function it covers. Some of them are
 - a) **Accounting Applications:** Accounting applications range from application software such as TALLY and wings to high-end applications such as SAP and Oracle Financials. *These are used by business entities for the purpose of day-to-day transactions of accounting and generating financial information such as balance sheet, profit and loss account and cash flow statements.*
 - b) **Office Management Software:** These applications help entities to manage their office requirements like word processors (MS Word), electronic spreadsheets (MS Excel), presentation software (PowerPoint), file sharing systems, etc. *The purpose is to automate the day-to-day office work and administration.*
 - c) **Compliance Applications:** Enterprises need to comply with applicable laws and regulations. *India has taken a long stride in adopting e-compliance for its citizens with government promoting e-filing of documents, e-payments taxes, e-storage of data, etc.*
 - d) **Customer Relationship Management Software:** These are specialized applications catering to the need of organizations largely in FMCG (Fast-Moving Consumer Goods) categories. *These entities need to interact with their customers and respond to them. The response may be in the form of service support or may lead to product innovation.* **(N14 MTP2 - 1M)**
 - e) **Management Support Software:** These are applications catering to decision-making needs of the management. *They may be further classified based on the level of management using them. For example, Management Information System is generally used by middle level managers for their decision making needs. On the other hand Decision Support Systems are used by top management for their information requirements.*
 - f) **ERP Software:** These applications called as Enterprise Resource planning software, which are used by entities to manage resources optimally and to maximize the three Es i.e. Economy, Efficiency and Effectiveness of business operations.
 - g) **Product Lifecycle Management Software:** These business applications are used by enterprises that launch new products and are involved in development of new products.

- h) **Logistics Management Software:** For large logistics managing companies, these are key business applications. These companies need to keep track of products and people across the globe to check whether there are any discrepancies that need action.
- i) **Legal Management Software:** In India, a lot of effort is being put to digitize the legal system. Government of India is keen to reduce the pendency in courts. *As this process goes on legal profession in India shall need such systems.*
- j) **Industry Specific Applications:** These are industry specific applications focused on a specific industry sector. For example, software designed especially for banking applications, Insurance applications, Automobile dealer system, billing systems for malls, Cinema ticketing software, Travel industry related software, etc.

4.

What are the Objectives of Business Process Automation (BPA)?

(PM, N14 - 2M, N14 MTP2 - 2M)

The success of any business process automation shall only be achieved when BPA ensures:

1. **Confidentiality:** To ensure that data is only available to persons who have right to see the same;
2. **Integrity:** To ensure that no unauthorized amendments can be made in the data.
3. **Availability:** To ensure that data is available when asked for.
4. **Timeliness:** To ensure that data is made available in at the right time.

5.

Why Business Process Automation? (or) What are the benefits of BPA?

1. BPA is the basic component of an enterprise-wide automation and management scheme for both business and IT workflow.
2. BPA can optimize and streamline business processes by automating the process components.
3. BPA improves the performance, accuracy and efficiency of the key business processes.
4. **Benefits:**
 - a) **Reducing the Impact of Human Error:** BPA removes human participation in the process, which is the source of many errors.
 - b) **Transforming Data into Information:** BPA can collect and store data also analyze data and make it available in a form that is useful for decision-making.
 - c) **Improving performance and process effectiveness:** In many cases, tasks that must be done manually are the bottleneck in the process. Automating those manual tasks speeds up the effective throughput of the application.
 - d) **Making users more efficient and effective:** People can focus their energies on the tasks they do best, allowing the computers to handle those that machines are best suited for.
 - e) **Making the business more responsive:** Enterprises can easily automate new applications and processes as they are introduced that provide greater control over business and IT processes.
 - f) **Improving Collaboration and Information Sharing:** Business processes designed through a collaborative interface mean IT can integrate its processes with the business-side logic that drives day-to-day operations.
 - g) **Cost Saving:** Automation leads to saving in time and labor costs through higher efficiency and better management of the people involved;
 - h) **To remain competitive:** To provide the level of products and services as offered by competition.
 - i) **Fast service to customers:** Automation shortens cycle times in the execution of processes through improved and refined business workflows and help enterprises to serve their customers faster and better.

6.

Explain How to go about BPA? (or) Discuss the steps involved in implementation of BPA? (N14RTP, N15 MTP1 - 4M)

The steps to go about implementing business process automation

Step 1: Define why we plan to implement a BPA: The primary purpose for which an enterprise implements automation may vary from enterprise to enterprise.

Step 2: Understand the rules / regulation under which enterprise needs to comply with:

One of the most important steps in automating any business process is to understand the rules of engagement, which include the rules, adhering to regulations and document retention requirements.

Step 3: Document the process, we wish to automate: At this step, all the documents that are currently being used need to be documented.

Step 4: Define the objectives/goals to be achieved by implementing BPA: Once the above steps have been completed, entity needs to determine the key objectives of the process improvement activities.

Step 5: Engage the business process consultant: To achieve BPA, decide which company/ consultant to partner with, depends upon Objectivity of consultant in understanding/evaluating entity situation.

Step 6: Calculate the ROI for project: The right stakeholders need to be engaged and involved to ensure that the benefits of BPA are clearly communicated and implementation becomes successful.

Step 7: Developing the BPA: Once the requirements have been documented, ROI has been computed and top management approval to go ahead has been received, the consultant develops the requisite BPA.

Step 8: Testing the BPA: Once developed, it is important to test the new process to determine how well it works and the process of testing is an iterative process, the objective being to remove all problems during this phase.

7.

What are the Applications that help entity to achieve BPA? (or) Discuss some of the applications that help enterprise to achieve Business Process Automation. (N15 MTP2-5M)

1. Many applications are available today that help enterprise to achieve business process automation. Few applications may be simpler; others may be more complex based on nature of process being considered.
2. Some of them are:
 - a) **TALLY:**
 - i) It is an accounting application that helps entity to automate processes relating to accounting of transactions.
 - ii) It also helps to achieve automation of few processes in inventory management.
 - iii) The latest version has been upgraded to help user achieve TAX compliances also.
 - iv) *It has features such as Remote Access Capabilities, Tax Audit and Statutory Compliance, Payroll, Excise for Manufacturers, Multilingual Support, VAT Composition Returns, TDS, VAT (Value Added Tax) etc.*
 - b) **SAP R/3:**
 - i) SAP R/3 is ERP software, which allows an entity to integrate its business processes.
 - ii) ERP stands for Enterprise Resource Planning, which aims at better utilization of the resources and helps entity achieve better business performance.
 - iii) *It has the features such as time management, reporting and analysis, budget monitoring, workflow approval, sales management, team management, leave management, travel management, recruitment management and demand planning.*
 - c) **MS Office Applications:** (N15 - 2M, N14 MTP1-1M)
 - i) These are various office automation systems made available by Microsoft Corporation which include MS Word, MS Excel, MS PowerPoint, MS Access, etc.

- ii) It has features such as customized ribbon, backstage view, built-in graphics toolset, enhanced security, excel spark lines, pivot for Excel, PowerPoint broadcast, Power Point compression, paste, preview and outlook conversation view.

d) Attendance Systems:

- i) The application helps entity to automate the process of attendance tracking and report generation.
- ii) It has features such as supervisor login access, holiday pay settings, labour distribution, employee scheduling and rounding, employee view time card, overtime settings, battery-backed employee database and optional door/gate access control etc.

e) Vehicle Tracking System:

- i) Applications allowing owner of goods to check the temperature of cold stored goods while in transit.
- ii) It has features such as GPS based location, GPRS connection based real-time online data-logging and reporting, route accuracy on the fly while device is moving, real-time vehicle tracking, SMS & e-mail notifications.

f) Travel Management Systems:

- i) Many business processes specific to this industry have been automated, including ticket booking for air, bus, train, hotel, etc.
- ii) It has features such as streamlined foreign travel approval process, 'safe return' process for people tracking, traveler portal for up to date information, secure traveler profile information, online retrieval of e-tickets, reservations, front, mid and back office tools on a single, and web based platform.

g) Educational Institute Management Systems:

- i) ICAI, itself is a good example of this automation.
- ii) A student based on his registration number can file many documents online including exam forms.
- iii) It has features such as student's registration, student's admission, fee collection, student's attendance, result management, result analysis, library management, HR management, staff attendance, payroll system, timetable management, financial accounting, assets management and MIS.

h) Automated Toll Collection Systems:

- i) Many toll booths allow users to buy pre-paid cards, where user need not stop in lane to pay toll charges, but just swipe / wave the card in front of a scanner.
- ii) It has features such as real-time toll plaza surveillance system, automatic vehicle identification system (based on in-road sensors), license plate recognition, zoom capability on captured images, laser based toll audit systems, automated vehicle classification, transaction processing and violation enforcement

i) Department Stores Systems:

- i) There has been huge development in the retail sector in India, which includes the billing processes and inventory management.
- ii) It has features such as point of sale, multi-channel operation, supplier database, products database, purchase ordering, management reporting, multiple promotions, loyalty schemes, stock control and inventory management.

j) File Management System:

- i) With increasing inventory of office files and records, many office automation systems have been developed.
- ii) These allow office records to be kept in soft copy and easy tracking of the same.
- iii) It has features such as web access, search, Microsoft office integration, records management software, electronic forms (e-forms), calendar, etc.

8.	Define the term Control? What are the major Control Objectives in Business Process Automation (BPA)? (N15 - 4M, N14RTP, N14 MTP1 - 4M)
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1. Control is defined as policies, procedures, practices and organization structure that are designed to provide reasonable assurance that business objectives are achieved and undesired events are prevented or detected and corrected.
2. Controls can be divided into two types:
 - a) **Managerial Controls:** The controls at this level provide a stable infrastructure in which IS can be built, operated, and maintained on a day-to-day basis.
 - b) **Application Controls:** Application controls are the controls on the sequence of processing events. These controls cover all phases of data right from data origination to its final disposal.
(M15 MTP1 - 2M)
3. Major control objectives are given as follows:
 - a) **Authorization:** Ensures that all transactions are approved by responsible personnel in accordance with their specific or general authority before the transaction is recorded.
 - b) **Completeness:** Ensures that no valid transactions have been omitted from the accounting records.
 - c) **Accuracy:** Ensures that all valid transactions are accurate, consistent with the originating transaction data, and information is recorded in a timely manner.
 - d) **Validity:** Ensures that all recorded transactions fairly represent the economic events that actually occurred, are lawful in nature, and have been executed in accordance with management's general authorization.
(N15RTP)
 - e) **Physical Safeguards and Security:** Ensures that access to physical assets and information systems are controlled and properly restricted to authorized personnel.
 - f) **Error Handling:** Ensures that errors detected at any stage of processing receive prompts corrective action and are reported to the appropriate level of management.
 - g) **Segregation of Duties:** Ensures that duties are assigned to individuals in a manner that ensures that no individual can control both the recording function and the procedures relative to processing a transaction.
4. The controls are used to Prevent, Detect, or Correct unlawful events. An unlawful event can arise if unauthorized, inaccurate, incomplete, redundant, ineffective, or inefficient input enters the system
 - a) **Preventive:** those which prevent occurrences of an error say security guard.
 - b) **Detective:** those which capture an error say audit trail.
 - c) **Corrective:** those which correct an error or reduce the loss due to errors/risk say insurance policy.

9.	Explain various Managerial Controls in detail?
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- A. **Top Management and Information Systems Management Controls: (NOV16 -4M)**
 - a) The senior managers who take responsibility for IS function in an organization face many challenges.
 - b) The major functions that a senior manager must perform are as follows:
 - i) **Planning** – determining the goals of the information systems function and the means of achieving these goals;
 - ii) **Organizing** – gathering, allocating, and coordinating the resources needed to accomplish the goals;
 - iii) **Leading** – motivating, guiding, and communicating with personnel.
 - iv) **Controlling** – comparing actual performance with planned performance as a basis for taking any corrective actions that are needed.
 - c) Top management must prepare two types of information systems plans for the information systems function: a Strategic plan and an Operational plan.

- d) The strategic Plan is the long-run plan covering and Operational Plan is the short-plan covering.
- e) Both the plans need to be reviewed regularly and updated as the need arises.

B. Systems Development Management Controls:

- a) Systems Development Management has responsibility for the functions concerned with analyzing, designing, building, implementing, and maintaining information systems.
- b) Three different types of audits may be conducted during system development process.

Concurrent Audit	Auditors are members of the system development team. They assist the team in improving the quality of systems development for the specific system they are building and implementing.
Post implementation Audit	Auditors seek to help an organization learn from its experiences in the development of a specific application system. In addition, they might be evaluating whether the system needs to be scrapped, continued, or modified in some way.
General Audit	Auditors evaluate systems development controls overall. They seek to determine whether they can reduce the extent of substantive testing needed to form an audit opinion about management's assertions relating to the financial statements for systems effectiveness and efficiency.

C. Programming Management Controls:

(N15 MTP2-3M)

- a) The primary objectives of Program development and implementation phase are to produce or acquire and to implement high-quality programs.
- b) The program development life cycle comprises six major phases – Planning; Design; Control; Coding; Testing; and Operation and Maintenance with Control phase running in parallel for all other phases.
- c) The purpose of the control phase during software development or acquisition is to monitor progress against plan and to ensure software released for production use is authentic, accurate, and complete.

Phases of Program Development Life Cycle

Phase	Controls
Planning	Techniques like Work Breakdown Structures (WBS), Gantt Charts and PERT (Program Evaluation and Review Technique) Charts can be used to monitor progress against plan.
Design	A systematic approach to program design, such as any of the structured design approaches or object-oriented design is adopted.
Coding	Programmers must choose a module implementation and integration strategy (like Top-down, bottom-up and Threads approach), a coding strategy (that follows the percepts of structured programming), and a documentation strategy (to ensure program code is easily readable and understandable).
Testing	Three types of testing can be undertaken: 1. Unit Testing – which focuses on individual program modules; 2. Integration Testing – Which focuses in groups of program modules; and 3. Whole-of-Program Testing – which focuses on whole program. These tests are to ensure that a developed or acquired program achieves its specified requirements.
Operations & Maintenance	Management establishes formal mechanisms to monitor the status of operational programs so maintenance needs can be identified on a timely basis. Three types of maintenance can be used – Repair maintenance – in which program errors are corrected; Adaptive Maintenance – in which the program is modified to meet changing user requirements; and Perfective Maintenance - in which the program is tuned to decrease the resource consumption.

D. Data Resource Management Controls:

- a) Data is a critical resource that must be managed properly. Accordingly, centralized planning and control must be implemented.
- b) For data to be managed better users must be able to share data, data must be available to users when it is needed, in the location where it is needed, and in the form in which it is needed.
- c) It allows easy modification of data and the integrity of the data must be preserved.
- d) If data repository system is used properly, it can enhance data and application system reliability.
- e) Careful control should be exercised over the roles by appointing senior, trustworthy persons, separating duties to the extent possible and maintaining and monitoring logs of the data administrator's and database administrator's activities.

E. Quality Assurance Management Controls:**(N15RTP)**

- a) Organizations are increasingly producing safety-critical systems and users are becoming more demanding in terms of the quality of the software they employ to undertake their work.
- b) Organizations are undertaking more ambitious (determined) information systems projects that require more stringent quality requirements and are becoming more concerned about their liabilities if they produce and sell defective software.

F. Security Management Controls:**(N15MTP1 - 2M)**

- a) Information security administrators are responsible for ensuring that information systems assets are secure.
- b) Assets are secure when the expected losses that will occur over some time are at an acceptable level.
- c) Some of the major threats and to the security of information systems and their controls are:

Major threats and their control measures

Threat	Control
Fire	Well-designed, reliable fire-protection systems must be implemented.
Water	Facilities must be designed and sited to mitigate losses from water damage
Energy Variations	Voltage regulators, circuit breakers, and uninterruptible power supplies can be used.
Structural Damage	Facilities must be designed to withstand structural damage.
Pollution	Regular cleaning of facilities and equipment should occur.
Unauthorized Intrusion	Physical access controls can be used.
Viruses and Worms	Controls to prevent use of virus-infected programs and to close security loopholes that allow worms to propagate.
Misuse of software, data and services	Code of conduct to govern the actions of information systems employees.
Hackers	Strong, logical access controls to mitigate losses from the activities of hackers.

G. Operations Management Controls:

- a) Operations management is responsible for the daily running of hardware and software facilities.
- b) Operations management typically performs controls over the functions like Computer Operations, Communications Network Control, Data Preparation and Entry, Production control, File Library, Documentation and Program Library, Help Desk/Technical support, Capacity Planning and Performance Monitoring and Outsourced Operations.
- c) Operations management control must continuously monitor the performance of the hardware/software platform to ensure that systems are executing efficiently, an acceptable response time or turnaround time is being achieved, and an acceptable level of uptime is occurring.

10. Discuss Boundary controls in detail?

Controls in the boundary subsystem have three purposes –

- a) To establish the identity and authenticity of would-be-users.
- b) To establish the identity and authenticity of computer-system resources that users wish to employ.
- c) To restrict the actions undertaken by users who obtain computer resources to an authorized set.

1. Boundary control techniques:

- a) **Cryptography:** There are programs that transform data into codes that appear meaningless to anyone who does not have authentication to access the respective system resource or file.
(N14 MTP1-1M)
- b) **Passwords:** User identification by an authentication mechanism with personal characteristics like name, birth date, employee code, function, designation, etc. Or a combination of two or more of these can be used as a password boundary access control.
- c) **Personal Identification Numbers (PIN):** The personal identification number is similar to a password assigned to a user and encrypted using a cryptographic algorithm. *The application generates a random number stored in its database independent of user identification details or a customer selected number.*
(N15RTP)
- d) **Plastic Cards:** (N14RTP)
 - i) Plastic / Identification cards store information required in an authentication process.
 - ii) These cards are used to identify a user need to go through procedural controls like application for a card, preparation of the card, issue of the card, use of the card and return of the card or card termination phases.
- e) **Digital Signatures:** Digital Signatures establish the authenticity of persons and prevent the denial of messages or contracts when data is exchanged electronically.
- f) **Access controls:** (Refer 3rd chapter, Q.No 27) (N14 MTP2-1M)

11. Discuss Input Controls in detail?**(M15 - RTP)**

1. Input Controls are responsible for ensuring the accuracy and completeness of data and instruction input into an application system.
2. Input controls are important since substantial time is spent on inputting data which involves human intervention and are therefore prone to errors and fraud.
3. The type of data input method used in an information system affects asset safeguarding, data integrity, system effectiveness, and system efficiency objectives.
4. Input control techniques are:
 - a) **Source Document Control:**
 - i) A well designed source document reduces the likelihood of data recording errors, increases the speed with which data be recorded and controls the work flow.
 - ii) Source document controls facilitates the data entry into a computer system and subsequent reference checking.
 - b) **Data Coding Controls:** These controls are put in place to reduce user error during data feeding.
 - c) **Batch Controls:** These are put in place at locations where batch processing is being used. Batch processing is where there is a time gap between occurrence and recording of transactions, that is, transactions are not recorded at the time of occurrence but are accumulated and a set (based on number/ time) is processed.
(N14 MTP1 - 2M)
 - d) **Validation Controls:** These validate the accuracy/correctness of input data. Input Validation Controls are intended to detect errors in transaction data before the data are processed.

12. Discuss Process Controls in brief.**(M15 - 4M, M15 MTP2 - 1M)**

1. Data processing controls perform validation checks to identify errors during processing of data.
2. They are required to ensure both the completeness and the accuracy of data being processed.

Some of the update controls are:

1. **Run-to-run Totals:**
 - a) These help in verifying data that is subject to process data through different stages.
 - b) A specific record (probably the last record) can be used to maintain the control total.
2. **Reasonableness Verification:** Two or more fields can be compared and cross verified to ensure their correctness.
3. **Edit Checks:** Edit checks similar to the data validation controls can also be used at the processing stage to verify accuracy and completeness of data.
4. **Field Initialization:** Data overflow can occur, if records are constantly added to a table or if fields are added to a record without initializing it, i.e., setting all values to zero before inserting the field or record.
5. **Exception Reports:** Exception reports are generated to identify errors in data processed. *Such exception reports give the transaction code and why the particular transaction was not processed and what error in processing the transaction.*
6. **Existence/Recovery Controls:** The check-point/restart logs, facility is a short-term backup and recovery control that enables a system to be recovered if failure is temporary and localized.

13. Discuss Output Controls in detail?

1. Output controls ensure that the data delivered to users will be presented, formatted and delivered in a consistent and secured manner.
2. Output can be in any form, it can either be a printed data report or a database file in a removable media such as a flash drive or CD-ROM or it can be a Word document on the computer's hard disk.
3. Whatever the type of output, it should be ensured that the confidentiality and integrity of the output is maintained and that the output is consistent.
4. Output controls have to be enforced both in a batch-processing environment as well as in an online environment.
5. **Storage and Logging of Sensitive and Critical Forms:**
 - a) Pre-printed stationery should be stored securely to prevent unauthorized destruction or removal and usage.
 - b) *Only authorized persons should be allowed access to stationery supplies such as security forms, negotiable instruments etc.*
6. **Logging of Output Program Executions:** When programs, used for output of data, are executed, they should be logged and monitored.
7. **Controls over Printing:** It should be ensured that unauthorized disclosure of information printed is prevented.
8. **Report Distribution and Collection Controls:**
 - a) Distribution of reports should be made in a secure way to avoid unauthorized disclosure of data.
 - b) A log should be maintained as to what reports were printed and which of them where collected. Uncollected reports should be stored securely.
9. **Retention Controls:**
 - a) Retention controls consider the duration for which outputs should be retained before being destroyed.

b) Consideration should be given to the type of medium on which the output is stored.

10. **Existence/Recovery Controls:** These controls are needed to recover output in the event that it is lost or destroyed. If the output is written to a spool of files or report files and has been kept, then recovery is easy and straight-forward.

14.	What do you understand by Database Controls? Discuss in brief?	(M15 MTP2 - 2M)
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1. Database controls protect the integrity of a database when application software acts as an interface to interact between the user and the database.
2. **Sequence Check Transaction and Master Files:**
 - a) Synchronization and the correct sequence of processing between the master file and transaction file is critical to maintain the integrity of updation, insertion or deletion of records in the master file with respect to the transaction records.
 - b) *If errors in this stage are overlooked, it leads to corruption of the critical data.*
3. **Ensure all records on files are processed:** While processing the transaction file records mapped to the respective master file the end-of-file of the transaction file with respect to the end-of-file of the master file is to be ensured.
4. **Process multiple transactions for a single record in the correct order:** Multiple transactions can occur based on a single master record. For example, dispatch of a product to different distribution centers. The order in which transactions are processed against the product master record must be done based on a sorted transaction codes.

15.	Discuss Communication Controls in detail?
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Communication Controls: Components in the communication subsystem are responsible for transporting data among all the other subsystems within a system and for transporting data to or receiving data from another system.

The communication subsystem can be subjected to passive or active subversive attacks.

1. **Physical Component Controls:** These controls involve Transmission Media - Bounded (Guided) Media or Unbounded (Unguided) Media; Communication Lines – Private (Leased) or Public; Modems; Port Protection Devices; Multiplexors and Concentrators.
2. **Line Error Controls:** Error Detection (using Parity Checking, Cyclic Redundancy Checks (CRC) and Loop Check) and Error Correction (using forward Error Correcting Codes and Backward Error Correction) are the two major approaches under Line Error Controls.
3. **Flow Controls:** The simplest form of flow control is “Stop-and-Wait Flow Control” in which the sender transmits a frame of data only when the receiver is ready to accept the frame.
4. **Link Controls:** This involves two common protocols – HDLC (Higher Level Data Control) and SDLC (Synchronous Data Link Control);
5. **Topological Controls:** A communication network topology specifies the location of nodes within a network, the ways in which these nodes will be linked, and the data transmission capabilities of the links between the nodes. Some of the four basic topologies include Bus, Ring, Star and Tree Topology.
6. **Channel Access Controls:** These techniques fall into two classes – Polling methods and Contention methods. Polling techniques establish an order in which a node can gain access to channel capacity; whereas in Contention methods, nodes in a network must compete with each other to gain access to a channel.
7. **Internetworking Controls:** Internetworking is the process of connecting two or more communication networks together to allow the users of one network to communicate with the users of other networks. Three types of devices are used to connect sub-networks in an Internet: Bridge, Router and Gateway.

16.	What do you mean by the term Network Virtualization? Explain Major application of Virtualization? (M15 – 2M, N15RTP, M15 MTP1 - 5M)
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1. Virtualization is the process of creating logical computing resources from available physical resources.
2. This is accomplished using virtualization software to create a layer of abstraction between workloads and the underlying physical hardware.
3. *Once installed, the virtualized computing resources such as memory, CPUs, network and disk I/O and storage can all be pooled and provisioned to workloads without regard for physical location within a data center.*
4. Network Virtualization allows a large physical network to be provisioned into multiple smaller logical networks and conversely allows multiple physical LANs to be combined into a larger logical network.
5. This behavior allows administrators to improve network traffic control, organize and provide security.

Major applications:**a) Server Consolidation:**

- i) Virtual machines are used to consolidate everything.
- ii) *Each physical server is reflected as a virtual machine "guest" residing on a virtual machine.*
- iii) Many physical servers are grouped into fewer servers to form virtual machines. This is also known as "Physical-to-Virtual" or 'P2V' transformation.

b) Disaster Recovery: Virtual machines can be used as "hot standby" environments for physical production servers. This changes the classical "backup-and-restore" philosophy, by providing backup images that can "boot" into live virtual machines, capable of taking over workload for a production server experiencing an outage.**c) Testing and Training:** Hardware virtualization can give root access to a virtual machine. This can be very useful such as in kernel development or operating system environment.**d) Portable Applications:** Portable applications are needed when running an application from a removable drive, without installing it on the system's main disk drive.**e) Portable Workspaces:** Recent technologies have used virtualization to create portable workspaces on devices like iPods and USB memory sticks.

17.	Explain some common types of Virtualization?	(PM)
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Some common types of Virtualization

Hardware Virtualization:

- a) Hardware Virtualization or Platform Virtualization refers to the creation of a virtual machine that acts like a real computer with an operating system.
- b) The basic idea of Hardware virtualization is to consolidate many small physical servers into one large physical server so that the processor can be used more effectively.
- c) The software that creates a virtual machine on the host hardware is called a hypervisor or Virtual Machine Manager.
- d) The hypervisor controls the processor, memory and other components by allowing several different operating systems to run on the same machine without the need for a source code.
- e) The operating system running on the machine will appear to have its own processor, memory and other components.

Network Virtualization:**(M15RTP)**

- a) Network virtualization is a method of combining the available resources in a network by splitting up the available bandwidth into channels, each of which is independent from the others, and each of which can be assigned (or reassigned) to a particular server or device in real time.

- b) This allows a large physical network to be provisioned into multiple smaller logical networks and conversely allows multiple physical LANs to be combined into a larger logical network.
- c) This behavior allows administrators to improve network traffic control, enterprise and security. Network virtualization involves platform virtualization, often combined with resource virtualization.

Storage Virtualization:

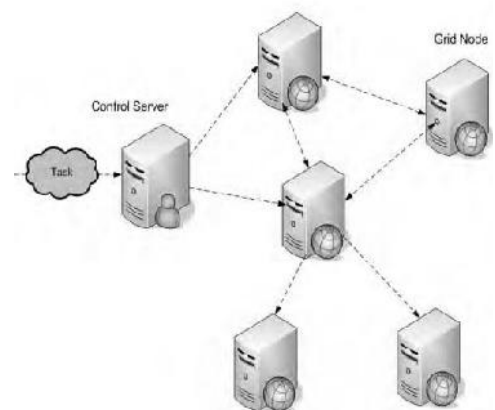
- a) Storage virtualization is the apparent pooling of data from multiple storage devices, even different types of storage devices, into what appears to be a single device that is managed from a central console.
- b) Storage virtualization helps the storage administrator perform the tasks of backup, archiving, and recovery more easily -- and in less time -- by disguising the actual complexity of a Storage Area Network (SAN).
- c) Administrators can implement virtualization with software applications or by using hardware and software hybrid appliances.
- d) The servers connected to the storage system aren't aware of where the data really is.
- e) Storage virtualization is sometimes described as "abstracting" the logical storage from the physical storage.

18.

What is Grid Computing? Explain various application areas of Grid Computing?

(N14 – 4M, N14RTP, M15 MTP1 - 3M, N14 MTP1 - 4M)

- 1. Grid Computing is a computer network in which each computer's resources are shared with every other computer in a communication system.
- 2. Processing power, memory and data storage are allocated to authorized users then resources are accessed by users to perform specific tasks.
- 3. A grid computing system can be as simple as a collection of similar computers running on the same operating system or as complex as inter- networked systems comprised of every computer platform.
- 4. Grid computing is a form of distributed computing where a virtual computing system is created by using many loosely connected computing devices to perform a large computing task.
- 5. In distributed computing, different computers within the same network share one or more resources.
- 6. In the ideal grid computing system, every resource is shared, turning a computer network into a powerful supercomputer performance.



Application Areas of Grid Computing:

- 1. Civil engineers work together to design, execute, & analyze shake table experiments.
- 2. An insurance company mines data from partner hospitals for fraud detection.
- 3. An application service provider offloads excess load to a compute cycle provider.
- 4. An enterprise configures internal & external resources to support e-Business.
- 5. Large-scale science and engineering are done through the interaction of people, heterogeneous computing resources, information systems and instruments, all of which are geographically and organizationally distributed.

19. What are the reasons of using Grid Computing? (Or) Briefly explain grid computing benefits? (M15 MTP1 - 3M)

- a) **Making use of Underutilized Resources:** Grid computing provides a framework for exploiting these underutilized resources and thus has the possibility of substantially increasing the efficiency of resource usage.
- b) **Resource Balancing:** This feature of grid computing handles occasional peak loads of activity in parts of a larger organization. An unexpected peak can be routed to relatively idle machines in the grid;
- c) **Parallel CPU Capacity:** A CPU-intensive grid application can be thought of as many smaller sub-jobs, each executing on a different machine in the grid.
- d) **Virtual resources and virtual organizations for collaboration:** The users of the grid can be organized dynamically into a number of virtual organizations, each with different policy requirements. These virtual organizations can share their resources, collectively as a larger grid.
- e) **Access to additional resources:** In addition to CPU and storage resources, a grid can provide access to other resources such as bandwidth to perform a complex task.
- f) **Reliability:** The machines also use duplicate processors in such a way that when they fail, one can be replaced without turning the other off. Power supplies and cooling systems are also duplicated.
- g) **Management:** The goal to virtualize the resources on the grid and more uniformly handle heterogeneous systems create new opportunities to better manage a larger, more distributed IT infrastructure. The grid offers management of priorities among different projects.

20. Discuss the constraints that need to be taken into consideration while developing a secured Grid Architecture? (PM, NOV16 - 4M)

To develop secured grid architecture, following constraints are taken from the characteristics of grid environment and application.

Single Sign-on: A user should authenticate once and they should be able to acquire resources, use them, and release them and to communicate internally without any further authentication.

Protection of Credentials: User passwords, private keys, etc. should be protected.

Interoperability with local security solutions: Access to local resources should have local security policy at a local level. Despite of modifying every local resource there is an inter-domain security server for providing security to local resource.

Exportability: The code should be exportable i.e. they cannot use a large amount of encryption at a time. There should be a minimum communication at a time.

Support for secure group communication: In a communication there are number of processes which coordinate their activities. This coordination must be secure and for this there is no such security policy.

Support for multiple implementations: There should be a security policy which should provide security to multiple sources based on public and private key cryptography.

21. Discuss Grid Computing w.r.t User perspective in detail?

Grid w.r.t User perspective:

Enrolling and installing Grid Software: The user positively establishes his identity with a Certificate Authority who must take steps to assure that the user is in fact who he claims to be. Once the user and/or machine are authenticated, the grid software is provided to the user for installing on his machine for the purposes of using the grid as well as donating to the grid.

Logging onto the grid: Most grid systems require the user to log on to a system using an ID that is enrolled in the grid. Once logged on, the user can query the grid and submit jobs.

Queries and submitting jobs: Grid systems usually provide command-line tools as well as graphical user interfaces (GUIs) for queries. Job submission usually consists of three parts, even if there is only one command required.

First, some input data and possibly the executable program or execution script file are sent to the machine to execute the job.

Second, the job is executed on the grid machine. The grid software running on the donating machine executes the program in a process on the user's behalf.

Third, the results of the job are sent back to the submitter.

Data configuration: The data accessed by the grid jobs may simply be staged in and out by the grid system. However, depending on its size and the number of jobs, this can potentially add up to a large amount of data traffic. This type is necessary for large jobs to better utilize the grid and not create unnecessary bottlenecks.

Monitoring progress and recovery: The user can query the grid system to see how his application and its sub-jobs are progressing. A grid system, in conjunction with its job scheduler, often provides some degree of recovery for sub-jobs that fail. A job may fail due to a Programming error, Hardware or power failure, Communications interruption, and Excessive slowness due to infinite loop or some other form of contention.

Reserving resources: To improve the quality of a service, the user may arrange to reserve a set of resources in advance for his high priority use. Such a reservation system can also be used in conjunction with planned hardware or software maintenance events.

22. Discuss Grid Computing w.r.t An Administrative perspective in detail?

Grid w.r.t An Administrative perspective:

Planning: The administrator should understand the organization's requirements for the grid to better choose the grid technologies that satisfy grid's requirements. One of the first considerations is the hardware available and how it is connected via a LAN or WAN. Next, an organization may want to add additional hardware to supplement the capabilities of the grid.

Security: Security is a much more important factor in planning and maintaining a grid where data sharing comprises the bulk of the activity. In a grid, the member machines are configured to execute programs rather than just move data. It is important to understand the issues involved in authenticating users and providing proper authorization for specific operations.

Organization: It is important to understand how the departments in an organization interact, operate, and contribute to the whole. Often, there are barriers built between departments and projects to protect their resources in an effort to increase the probability of timely success.

Installation: First, the selected grid system must be installed on an appropriately configured set of machines. These machines should be connected using networks with sufficient bandwidth to other machines on the grid.

Managing enrollment of donors and users: The administrator is responsible for controlling the rights of the users in the grid. Donor machines may have access rights that require management as well. The rights of these grid user IDs must be properly set so that grid jobs do not allow access to parts of the donor machine to which the users are not entitled.

Certificate Authority: An organization may choose to use an external Certificate Authority or operate one itself. The primary responsibilities of a Certificate Authority are:

- a) Positively identifying entities requesting certificates;
- b) Issuing, removing, and archiving certificates;
- c) Protecting the Certificate Authority server;
- d) Maintaining a namespace of unique names for certificate owners;
- e) Serving signed certificates to those needing to authenticate entities; and
- f) Logging activity.

Resource Management: Setting permissions for grid users to use the resources as well as tracking resource usage and implementing a corresponding accounting or billing system.

Data sharing: As a grid grows and the users become dependent on any of the data storage repositories, the administrator should consider procedures to maintain backup copies and replicas to improve performance. All of the resource management concerns apply to data on the grid.

23. What is meant by Cloud Computing?**(N14 – 4M, M14RTP, N15RTP)**

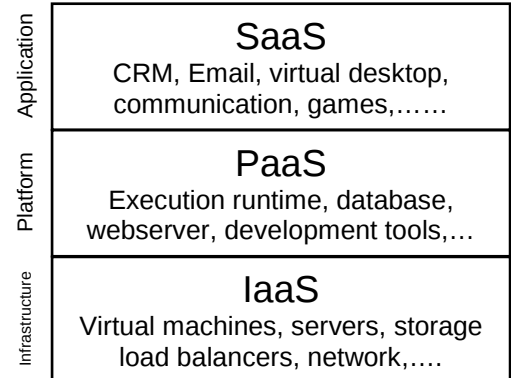
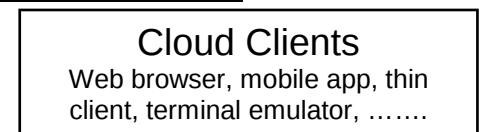
1. A cloud is a collection of servers, applications, databases, documents, agreements, spreadsheets, storage capacity etc which allows organizations to share these resources from anywhere.
2. Cloud Computing is the use of various services, such as software development platforms, servers, storage, and software, over the Internet, often referred to as the "cloud."
3. The best example of cloud computing is Google Apps where any application can be accessed using a browser and it can be deployed on thousands of computer through the Internet.
4. The common cloud computing service models are software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a service (IaaS).
5. *The service models are dynamically changing as cloud providers come out with new offerings focused on being competitive, increase market share, each with the aim to becoming one-stop shop.*

24. Explain different service models of cloud computing?**(PM, N14 MTP1 - 4M)**

1. There are five Cloud Computing Service based models.

a) Software as a Service (SaaS):**(N14 – 2M)**

- i) It includes a complete software offering on the cloud. Users can access a software application hosted by the cloud vendor on pay- per-use basis.
- ii) This is a well-established sector. SaaS is a model of software deployment where an application is hosted as a service provided to customers across the Internet.
- iii) By removing the need to install and run an application on a user's own computer.
- iv) It is seen as a way for businesses to get the same benefits as commercial software with smaller cost outlay (expense).
- v) *SaaS can reduce the burden of software maintenance.*

**b) Infrastructure as a Service (IaaS):**

- i) It is the foundation of cloud services. It provides clients with access to server hardware, storage, bandwidth and other fundamental computing resources.
- ii) The service is typically paid for on a usage basis.
- iii) The service may also include dynamic scaling so that if the customer needs more resources than expected, they can get them on the fly (probably to a given limit). It provides access to shared resources on need basis, without revealing details like location and hardware to clients.

c) Platform as a Service (PaaS):**(M15-2M, N15 MTP2-2M)**

- i) It provides clients with access to the basic operating software and optional services to develop and use software applications (e.g. database access and payment service) without the need to buy and manage the underlying computing infrastructure.
- ii) It has evolved from Software as a Service (SaaS) and Infrastructure as a service (IaaS).
- iii) *For example, Google App Engine allows clients to run their web applications (i.e. software that can be accessed using a web browser such as Internet Explorer over the internet) on Google's infrastructure.*
- iv) The major drawback of Platform as a Service is that it may lock us into the use of a particular development environment and stack of software components.

d) Network as a Service (NaaS):

(M15 - 2M)

- i) It is a category of cloud services where the capability provided to the cloud service user is to use network/transport connecting services.
- ii) NaaS involves optimization of resource allocation by considering network and computing resources as a whole. Some of the examples are: Virtual Private Network, Mobile Network Virtualization etc.

e) Communication as a Service (CaaS):

- i) CaaS has evolved in the same lines as SaaS.
- ii) CaaS is an outsourced enterprise communication solution that can be leased from a single vendor.
- iii) The CaaS vendor is responsible for all hardware and software management and offers guaranteed Quality of Service (QoS).
- iv) It allows businesses to selectively deploy communication devices and modes on a pay-as-you-go, as-needed basis.
- v) This approach eliminates the large capital investments. Examples are: Voice over IP (VoIP), Instant Messaging (IM).

25.

Explain the parts of cloud computing architecture? (or) Discuss Cloud Computing architecture? (PM, N15RTP, M15 MTP1 - 5M)

1. A cloud computing architecture consists of two parts - Front End and Back End that connects to each other through a network, usually Internet.
2. Cloud computing architecture refers to the components and subcomponents. **(NOV16 - 4M)**
3. Those are
 - a) **Front end:** The front end of the cloud computing system comprises of the client's devices (or it may be a computer network) and some applications are needed for accessing the cloud computing system. All the cloud computing systems do not give the same interface to users.
 - b) **Back end:** Back end refers to some physical peripherals. In cloud computing, the back end is cloud itself which may encompass various computer machines, data storage systems and servers. Groups of these clouds make a whole cloud computing system.
 - c) **Protocols:** There are some set of rules, generally called as Protocols which are followed by this server.
 - d) **Middleware:** Middleware that allow computers that are connected on networks to communicate with each other.

26.

What are the Characteristics of Cloud Computing?

(PM, M15 - 4M)

1. **Elasticity and Scalability:**
 - a) Cloud computing gives us the ability to expand and reduce resources according to the specific service requirement.
 - b) *For example, we may need a large number of server resources for the duration of a specific task. We can then release these server resources after we complete our task.*
2. **Pay-per-Use:** We pay for cloud services only when we use them, either for the short term or for a longer duration.
3. **On-demand:** Because we invoke cloud services only when we need them, they are not permanent parts of the IT infrastructure, this is a significant advantage for cloud use as opposed to internal IT services.
4. **Resiliency:** The resiliency of a cloud service offering can completely isolate the failure of server and storage resources from cloud users. Work is migrated to a different physical resource in the cloud with or without user awareness and intervention.
5. **Multi Tenancy:** Public cloud service providers often can host the cloud services for multiple users within the same infrastructure. Server and storage isolation may be physical or virtual depending upon the specific user requirements.

6. Workload Movement:

- a) This characteristic is related to resiliency and cost considerations.
- b) Cloud-computing provider migrates workload across servers both inside the data center and across data centers.

27.**Discuss the Advantages and Disadvantages of Cloud Computing?****(PM, M15RTP, N15 MTP2-2M)****Advantages:****(N15 - 4M, M15 MTP2-5M)**

1. **Cost Efficient:** Cloud computing is a cost efficient method to use, maintain and upgrade.
2. **Easy Access to Information:** It provides easy to access information from anywhere through an Internet connection.
3. **Almost Unlimited Storage:** Storing information in the cloud provides almost unlimited storage capacity.
4. **Backup and Recovery:** Since all the data is stored in the cloud, backing up and restoring is relatively much easier than storing the same on a physical device. *Furthermore, most cloud service providers are usually competent enough to handle recovery of information.*
5. **Automatic Software Integration:** In the cloud, software integration is usually something that occurs automatically.
6. **Quick Deployment:** The entire system can be fully functional in a matter of a few minutes.

Disadvantages:**1. Technical Issues:**

- a) This technology is always prone to outages and other technical issues.
- b) *Even the best cloud service providers run into this kind of trouble, in spite of keeping up high standards of maintenance. We will invariably be stuck in case of network and connectivity problems.*

2. **Security in the Cloud:** Surrendering all the company's sensitive information to a third-party cloud service provider could potentially put the company to great risk.

3. Prone to Attack:

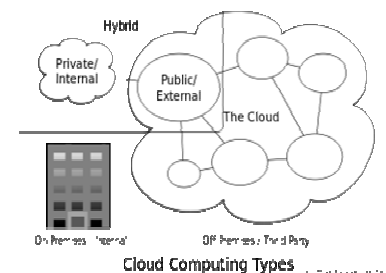
- a) Storing information in the cloud could make the company vulnerable to external hack attacks and threats
- b) *Nothing on the Internet is completely secure and hence, there is always the possibility of losing sensitive data.*

28.**Explain various deployment models? (or) Describe different types of clouds in cloud computing environment.****(PM, N14 – 4M, N14RTP, N14 MTP2 - 4M)**

1. The cloud computing environment can consist of multiple types of clouds based on their deployment and usage.

2. Public Clouds:

- a) The public cloud is made available to the general public or a large industry group. They are administrated by third parties or vendors over the Internet, and services are offered on pay-per-use basis.
- b) Public clouds are also known as external clouds.
- c) The key benefits are:
 - i) It is widely used in the development, deployment and management of enterprise applications, at affordable costs;
 - ii) It allows organizations to deliver highly scalable and reliable applications rapidly and at more affordable costs.



3. **Private Clouds:**

- This cloud computing environment resides within the boundaries of an organization and is used exclusively for the organization's benefits.
- These are also called internal clouds.
- The benefit is that it enables an enterprise to manage the infrastructure and have more control. It provides high security and scalability but is expensive.

4. **Community Clouds:**

- This is the sharing of computing infrastructure in between organizations of the same community.
- For example, all Government organizations within India may share computing infrastructure on the cloud to manage data.
- The risk is that data may be stored with the data of competitors.

5. **Hybrid Clouds:**

- It is maintained by both internal and external providers.
- It is a composition of two or more clouds (Private, Community or Public).
- They have to maintain their unique identity, but are bound together by standardized data and application portability.

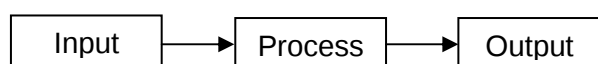
29.

Differentiate between manual information procession cycle and computerized information processing cycle? (PM)

- Information Processing:** Computer can be used as an aid to process data to provide information, which has meaning to the users.

2. **Manual Information Processing Cycle:**

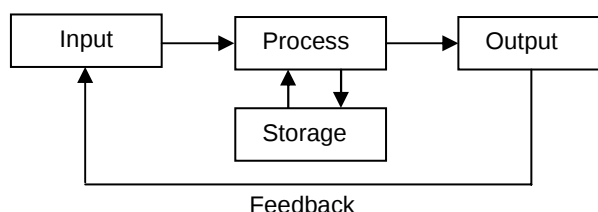
- Systems where the levels of manual intervention is very high. For example - evaluation of examination papers, teaching and operations in operation theaters.
- Components of manual information processing cycle include:
 - Input** : Put details in register.
 - Process** : Summarize the information.
 - Output** : Present information to management i n the form of reports.



3. **Computerized Information Processing Cycle:**

(M15 - 2M)

- These are systems where computers are used at every stage of transaction processing and human intervention is minimal.
- The components of a computerized information processing cycle include:
 - Input:** Entering data into the computer;
 - Processing:** Performing operations on the data;
 - Storage:** Saving data, programs, or output for future use
 - Output:** Presenting the results.
 - Feedback:** used to control the process.



5. BUSINESS PROCESS MANAGEMENT & IT

1. Define the terms (1) Process (2) Business Process Management?

Process:

(N14 RTP, M15 MTP1-1M, N15 MTP2-2M)

- a) Process is defined as a sequence of events that uses inputs to produce outputs.
- b) From a business perspective, a process is a coordinated and standardized flow of activities performed by people or machines, which can traverse functional or departmental boundaries to achieve a business objective and creates value for internal or external customers.

Business Process Management: BPM is defined as: “The achievement of an organization's objectives through the improvement, management and control of essential business processes”.

2. What is a business Process? Explain how to manage a process. (N14 MTP2 - 2M)

Business Process:

- a) A Business Process consists of a set of activities that are performed in coordination in an organizational and technical environment.
- b) These activities jointly realize a business goal.
- c) Each Business process is enacted by a single organization, but it may interact with business processes performed by other organizations.

To manage a process:

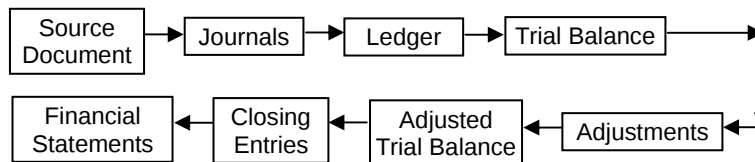
- a) The first task is to **define**. This involves defining the steps in the process and mapping the tasks to the roles involved in the process.
- b) Once the process is mapped and implemented, performance measures can be established. Establishing measurements creates a basis to improve the process.
- c) The last piece describes the organizational setup that enables the standardization of and adherence to the process throughout the organization.

3. Explain typical life cycle of an accounting transaction? (Or) Explain Book keeping life cycle in Business Process? (N14 MTP1 - 4M)

- a) Accounting or Book keeping cycle covers the business processes involved in recording and processing accounting events of a company.
- b) It begins when a transaction or financial event occurs and ends with its inclusion in the financial statements.

Life cycle of an accounting transaction:

- a) **Source Document:** Document the capture data from transactions.
- b) **Journal:** Transactions are recorded into journals from the source document.
- c) **Ledger:** Entries are posted to the ledger from the journal.
- d) **Trial Balance:** Unadjusted trial balance containing totals from all account heads is prepared.
- e) **Adjustments:** Appropriate adjustment entries are passed.
- f) **Adjusted Trial balance:** The trial balance is finalized post adjustments.
- g) **Closing entries:** Appropriate entries are passed to transfer accounts to financial statements.
- h) **Financial statement:** The accounts are organized into the financial statements.



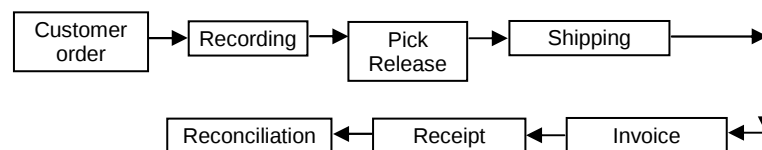
4.

Write about the lifecycle of a sales transaction (or) Explain the life cycle of Order to Cash (OTC or O2C)? (N15 MTP2 - 5M)

- Order to Cash (OTC or O2C) covers all the business processes relating to fulfilling customer requests for goods or services.
- It involves transactional flow of data from the initial point of documenting a customer order to the final point of collecting the cash.

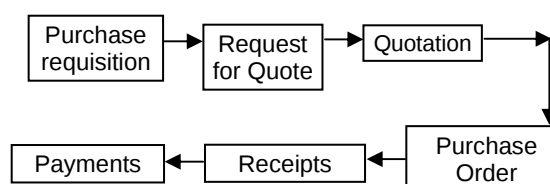
Life cycle of a sales transaction:

- Customer Order:** A purchase order received from a customer specifying the type quantity and agreed prices for products.
- Recording:** Availability of the items is checked and customer order is booked.
- Pick release:** The items are moved from the warehouse to the staging area.
- Shipping:** The items are loaded onto the carrier for transport to the customer.
- Invoice:** Invoice of the transaction is generated and sent to the customer.
- Receipt:** Money is received from the customer against the invoices.
- Reconciliation:** The bank reconciliation of all the receipts is performed.



5.

Explain the lifecycles of a purchase transaction? (or) Explain Procure to pay (purchase to pay or P2P) life cycle?



- Procure to Pay (Purchase to Pay or P2P)_cycle covers all the business processes relating to obtaining raw materials required for production of a product or for providing a service.
- It involves the transactional flow of data from the point of placing an order with a vendor to the point of payment to the vendor.

Life cycles of a purchase transaction:

- Purchase requisition:** A document is prepared requesting the purchase department to place an order with the vendor specifying the quantity and time frame.
- Request for quote:** An invitation is sent to the vendors to join a bidding process for specific products.
- Quotation:** The vendors provide cost quotations for the supply of products.
- Purchase order:** A commercial document is issued to the vendor specifying the type, quantity and agreed prices for products.
- Receipts:** The physical receipt of goods and invoices.
- Payments:** The payments are made against the invoices.

6. Explain Processing Cycles of Accounts BPM?**(N14RTP)****THE PROCESSING CYCLES OF AN ACCOUNTS BPM ARE:**

Financing Cycles: Provides a clear view of firms processing framework and involves activities of obtaining necessary funds to run the organization, repay creditors, and distribute profits to investors.

Revenue Cycle: It includes transactions surrounding the recognition of revenue involving accounts like Sales, Accounts Receivable, Inventory and General Ledger. It involves activities of selling goods or services and collecting payment for sales.

Source Document	Function
Sales Order	Record Customer Order
Delivery Ticket	Record Delivery to Customer
Remittance Advice	Receive Cash
Deposit Slip	Record Amounts Deposited
Credit Memo	Support Adjustments to Customer Accounts

Expenditure Cycle: It includes transactions surrounding the recognition of expenditures involving accounts like Purchases, Accounts Payable, Cash Disbursements, Inventory and General Ledger. It involves activities of buying and paying for goods or services used by the organization.

Source Document	Function
Purchase Requisition	Request that purchasing department order goods.
Purchase Order	Request goods from vendors.
Receiving Report	Record receipt of merchandise.
Check	Pay for items.

Human Resource Cycle: It involves activities of hiring and paying employees.

Source Document	Function
W4forms	Collect employee with holding data.
Timecards	Record time worked by employees.
Job time tickets	Record time spent on specific jobs.

Production Cycle - It involves the recurring set of business activities and related data processing operations associated with the manufacturers of products including activities like converting raw materials and labor into finished goods.

General Ledger & Reporting System – This involves the information processing operations involved in updating the general ledger and preparing reports that summarize the results of an organization's activities.

General Ledger and Reporting	
Journal voucher	Record entry posted to general ledger

Data Processing Cycle: This consists of following basic steps with alerts, controls and feedback at each step: **(N15RTP)**

- Data input** - Involves the activities like capturing the data, implementing control procedures, recording in journals, posting to ledgers and preparation of reports.
- Data storage** - Involves organizing the data in master file or reference file of an automated system for easy and efficient access.
- Data processing** - Involves addition, deletion and updating of the data in the transaction file, master file or reference file.
- Information output** - Involves generation of documents and managerial reports in printable or electronic form for addressing queries, to control operational activities and help the management in decision making.

7.

What is meant by Accounting Information System? Explain the Basic Functions of AIS? (M15 MTP2 - 1M)

1. An **Accounting Information System** is defined as a system of collection, storage and processing of financial and accounting data that is used by decision makers.
2. An accounting information system is generally a computer-based method for tracking accounting activity in conjunction with information technology resources.

Basic Functions of an Accounting Information System

- 1) The accounting information system is the mechanism that allows accountants to perform their accounting functions and tasks.
- 2) There are three basic functions of AIS:
 - a) **Collect and store data:**
 - i) Collect and store data about organization's business activities and transactions by capturing transaction data from source documents and posting data from journals to ledgers.
 - ii) Source documents are special forms used to capture transaction data such as sales order, sales invoice, order processing, purchase order, etc.
 - iii) Control over data collection is improved by pre-numbering each source document. *Accuracy and efficiency in recording transaction data can be further improved if source documents are properly designed.*
 - b) **Record transaction:**
 - i) Record transactions data into journals.
 - ii) These journals present a chronological record of what occurred and provide management with information useful for decision making.
 - iii) These documents are in the form of reports like financial statements, managerial reports, etc.
 - c) **Safeguarding organizational assets:**
 - i) Provide adequate controls to ensure that data are recorded and processed accurately by safeguarding organizational assets (data and systems).
 - ii) The two important methods for accomplishing this objective are by providing adequate documentation of all business activities and an effective segregation of duties.
 - iii) Documentation allows management to verify that assigned responsibilities were completed correctly.
 - iv) Segregation of duties refers to dividing responsibility for different portions of a transaction among several people.

(M15RTP)

8.

Explain Classification of Business Processes and mention different levels in business process management. (M15 MTP2-3M, N15 MTP1 - 4M)

1. Business processes are pervasive in any organization and represent all activities that an organization undertakes.
2. Business processes are broadly classified into two categories.
 - a) Organizational Business Processes
 - b) Operational Business Processes.
3. Different levels can be identified ranging from high-level Business strategies to implemented business processes.
 - a) **Business strategy:** Here, the strategy of the company is specified, which describes its long term concepts to develop a sustainable competitive advantage in the market.
 - b) **Goals:** Here, the business strategy is broken down to operational goals. These goals can be organized, and can be divided into a set of sub-goals.



- c) **Organizational business processes:** These are high-level processes that are typically specified in textual form by their inputs, their outputs, their expected results and their dependencies on other organizational business processes.
- d) **Operational Business Processes:** Here, the activities and their relationships are specified, but implementation aspects of the business process are disregarded. Operational business processes are specified by business process models. These are the basis for developing implemented business processes.
- e) **Implemented business processes:** This contain information on the execution of the process activities and the technical and organizational environment in which they will be executed.

9.

Write about Principles and Practices of BPM? (or) What are the key goals of Business Process Management?

Principles:

- a) Business processes are organizational assets that are central to creating value for customers;
- b) By measuring, monitoring, controlling, and analyzing business processes, a company can deliver consistent value to customers
- c) Business processes should be continuously improved
- d) Information technology is an essential enabler for BPM.

Practices:

- a) Attempt for process-oriented organizational structure
- b) Appoint process owners
- c) Senior management needs to commit and handle BPM
- d) Process improvements should take a bottom-up approach;
- e) Use information technology systems to monitor, control, analyze, and improve processes;
- f) Work collaboratively with business partners.
- g) Continuously train the personnel.
- h) Utilize both incremental (e.g., Six Sigma) and more radical (e.g., BPR) models to process improvement.

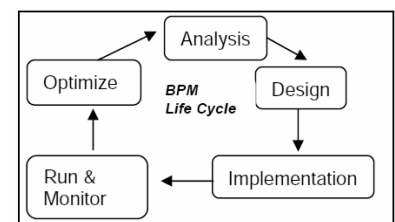
10.

Write about BPM Life Cycle [BPM – L]

(PM, M15RTP)

1. Business Process Management-Life cycle establishes a sustainable process management capability that empowers organizations to embrace and manage process changes successfully.
2. Business Process Management (BPM) is the methodology used by enterprises to improve end-to-end business processes in various stages.
3. It incorporates both human resources and Information technology infrastructure.
4. It follows a life-cycle having following phases:

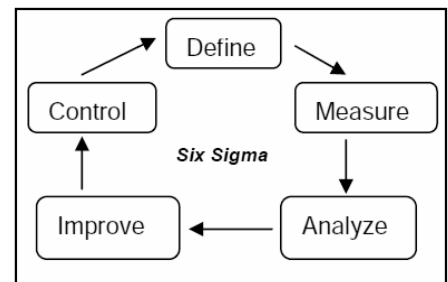
- a) **Analysis phase:** This involves analysis of the current environment and current processes, identification of needs and definition of requirements.
- b) **Design phase:** This involves evaluation of potential solutions to meet the identified needs, business process designing or business process modeling.
- c) **Implementation phase:** This involves project preparation, blue printing, realization, final preparation, go live and support.
- d) **Run and Monitor phase:** This involves business process execution or deployment and business process monitoring.
- e) **Optimize:** Iterate for continuous improvement.



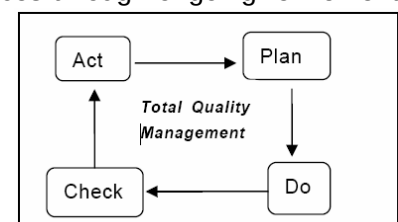
11. Write about Six sigma model.**(PM, N14RTP, N14 MTP2-1M, N15 MTP1 - 2M)**

1. Six sigma employs quality management and statistical analysis of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes.
2. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets.
3. For example: reduce process cycle time, reduce pollution, reduce costs, increase customer satisfaction, and increase profits.
4. It follows a life-cycle having following phases such as **DMAIC**:

- a) **Define:** Customers are identified and their requirements are gathered. Measurements that are critical to customer satisfaction [Critical to Quality, (CTQ)] are identified for further project improvement.
- b) **Measure:** Process output measures that are attributes of CTQs are determined and variables that affect these output measures are identified.
- c) **Analyze:** Using statistical methods and graphical displays, possible causes of process output variations are identified. These possible causes are analyzed statistically to determine root cause of variation.
- d) **Improve:** Solution alternatives are generated to fix the root cause. The most appropriate solution is identified using solution prioritization matrix and validated using pilot testing. Cost and benefit analysis is performed to validate the financial benefit of the solution. Implementation plan is drafted and executed.
- e) **Control:** Process is standardized and documented. Before and after analysis is performed on the new process to validate expected results, monitoring system is implemented to ensure process is performing as designed.

**12. Write about Total Quality Management? (or) Write about PDCA cycle?****(M15 - RTP, N14 MTP1 - 1M, M15 MTP2 - 2M)**

1. Total Quality Management (TQM) is a comprehensive and structured approach to organizational management that seeks to improve the quality of products and services through ongoing refinements in response to continuous feedback.
2. TQM can be applied to any type of organization; it originated in the manufacturing sector and has since been adapted for use in almost every type of organization.
3. TQM processes are divided into four sequential categories: Plan, Do, Check, and Act (PDCA cycle).



- a) **Plan:** In the planning phase, people define the problem to be addressed, collect relevant data, and ascertain the problem's root cause;
- b) **Do:** In the doing phase, people develop and implement a solution, and decide upon a measurement to gauge its effectiveness;
- c) **Check:** In the checking phase, people confirm the results through before-and-after data comparison;
- d) **Act:** In the acting phase, people document their results; inform others about process changes, and make recommendations for the problem.

13.

Define Business Process Reengineering (BPR)? Explain with suitable example.**(PM, N15RTP, M15 MTP1 - 2M)**

- a) Business Process Reengineering is defined as the fundamental rethinking and radical redesign of processes to achieve dramatic improvement, in the terms of performance such as cost, quality, service and speed.
- b) BPR aims at major transformation of the business processes to achieve dramatic improvement.
- c) It involves changes in organizational structures and in processes within the business environment.
- d) The entire technological, human, and organizational dimensions may be changed in BPR.
- e) *Information Technology plays a major role in BPR as it provides office automation which allows the business to be conducted in different locations.*
- f) *It also provides flexibility in manufacturing, permits quicker delivery to customers and supports rapid and paperless transactions.*
- g) Business Process Re-engineering is also known as Business Process Redesign, Business Transformation, or Business Process Change Management.
- h) A few important key words, which need clear understanding:
 - i) **Dramatic achievement:** It means to achieve 80% or 90% reduction (in say, delivery time, work in progress or rejection rate) and not just 5%, 10% reduction. This is possible only by making major improvements and breakthroughs, and not small incremental changes like in Total Quality Management (TQM).
 - ii) **Radical redesign:** Radical redesign means BPR is reinventing and not enhancing or improving. *In a nutshell, a "clean slate approach" of BPR says that "Whatever you were doing in the past is all wrong", do not get biased by it or reassemble, the new system is to be redesigned afresh.* **(M15 – 2M)**
 - iii) **Fundamental rethinking:** It means asking the question "why do you do what you do", thereby eliminating business processes altogether if it does not add any value to the customer. There is no point in simplifying or automating a business process which does not add any value to the customer.

14.

Discuss the Success factors of BPR?**(N14 MTP2 - 4M)****Some key factors for BPR projects to succeed are:****1. Organization wide commitment:**

- a) Changes to business processes would have a direct impact on processes, organizational structures, work culture, information flows, infrastructure & technologies and job competencies.
- b) This requires strong leadership, support and sponsorship from the top management.

2. BPR team composition:

- a) ABPR team is formed which would be responsible to take the BPR project forward and make key decisions and recommendations.
- b) The BPR team would include active representatives from top management, business process owners, technical experts and users.

3. Business needs analysis:

- a) It is important to identify exactly what current processes need reengineering. This would help to determine the strategy and goals for BPR.
- b) A series of sessions are held with the process owners and stakeholders and all the ideas would be evaluated to outline and conceptualize the desired business process.
- c) The outcome of this analysis would be BPR project plan – identifying specific problem areas, setting goals and relating them to key business objectives.

4. Adequate IT Infrastructure: Adequate investment in IT infrastructure in line is of vital importance to successful BPR implementation. Effective alignment of IT infrastructure to BPR strategy would determine the success of BPR efforts.

5. **Effective change management:** An effective change management process would consider the current culture to foster a change in the prevailing beliefs, attitudes and behaviors effectively. The success of BPR depends on how effectively management conveys the need for change to the people.
6. **Ongoing continuous improvement:** BPR is an ongoing process; hence innovation and continuous improvement are key to the successful implementation of BPR.

15. Describe the Key factors to consider in implementing BPM? (N14 - 4M, N15 MTP2 - 5M)

Factors	Key Considerations
Scope	A single process, a department, the entire company.
Goals	Process understanding, improvement, automation, re-engineering, optimization.
Methods to be used	Six Sigma, BPM Life Cycle Method, TQM, Informal methods.
Skills Required	Consultants, Train Employees, Formal Certification, Basic Education, Existing Skill sets.
Tools to be used	White-Boards, Sticky Notes, Software For Mapping. Documenting, Software for Simulation, Comprehensive BPMS.
Investments to Make	Training, Tools, Time.
Sponsorship/Buy-in Needed	Executive Level, Department Level, Process Owner Level, Employee Level.

16. What is Value Chain Automation? List out Six business functions of the value chain? (N14 RTP, N14 MTP2 - 4M, M15 MTP1 - 1M)

- Value chain refers to separate activities which are necessary to strengthen an organization's strategies and are linked together both inside and outside the organization.
- It is defined as a chain of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market.
- The idea of the Value Chain is based on the process view of organizations.
- Value chain of a manufacturing organization comprises of Primary and Supportive activities.*
- The primary ones are inclusive of inbound logistics, operations, outbound logistics, marketing and sales, and services.*
- The supportive activities relate to procurement, human resource management, technology development and infrastructure.*
- Six business functions of the value chain are as follows :
 - Research and development
 - Design of products, services, or processes
 - Production
 - Marketing and sales
 - Distribution
 - Customer service
- Value Chain Analysis is a useful tool for working out how we can create the greatest possible value for our customers.

17.	What is Business Process Automation & mention Benefits & Risks?	(M15 - 2M)
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- a) Business Process Automation (BPA) can be defined as removing the human element from existing business processes by automating the repetitive or standardized process components.
- b) BPA capabilities range from automating a simple data-entry- manipulation task to building complex, automated financial management processes using existing applications.
- c) The resulting benefits are cost reduction, elimination of human error, freeing people from routine and volume, and allow management to do what they are best at: make decisions, analyze data implications and trends and focus on providing better customer service.

<u>Benefits:</u>	(M15 RTP)
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- a) **Saving on costs:** Automation leads to saving in time and labour costs.
- b) **Staying ahead in competition:** In order to survive, businesses need to adopt automation
- c) **Fast service to customers:** Business managers realized that automation could help them to serve their customers faster and better.

Risks:

- a) **Risk to jobs:** Jobs that were earlier performed manually by several employees would post-automation would be mechanized, thereby posing a threat to jobs.
- b) **False sense of security:** Automating poor processes will not gain better business practices.

18.	List out the Benefits of BPMS (or) Benefits of IT on BPM?	(N15RTP)
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- a) **Automating repetitive business processes:** Processes such as report creation and distribution or the monitoring of or reporting on company's Key Performance Indicators (KPI) reduces the manual operational costs and helps employees to concentrate on activities that are important to the success of business.
- b) **BPMS works by 'loosely coupling' with a company's existing applications:** This enables it to monitor, extract, format and distribute information to systems and people; in line with business events or rules.
- c) **Operational Savings:** BPM focuses on optimization of processes. The processes that are repetitive are optimized and lead to reduced expenses which translate to immediate cost savings.
- d) **Reduction in the administration involved in Compliance and ISO Activities:** The BPM is ideally suited to help support companies in order to provide solutions for process improvement and compliance/governance certification. It gives full control over process and document change, clarity of inherent risks, and ease with which process knowledge is communicated across the company.
- e) **Freeing-up of employee time:** In business, for each additional hour it takes to complete a manual business process, there is a hard cost associated with employee time as well as soft costs associated with losing business or lowered productivity. BPM or BPR software is a fast-growing segment of the enterprise

19.	Write short notes on Business Risks of failure of IT. (Or) What are the major reasons for failure or BPMS.	(PM, N14 - 4M)
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Some of the other reasons for failure of BPMS include:

- a) Inadequate investment in ongoing training for involved personnel;
- b) Lack of corporate policy protecting the integrity of the data in the BPM Systems;
- c) Superficial or deficient executive involvement
- d) Deficient project management

- e) Breakdown in gap analysis
- f) Limited options for customization of the BPM software is required
- g) Not flexible enough or too complicated to be customized to meet the precise workflow and business process.
- h) Failure to identify future business needs.
- i) Inadequate assessment of the need for change management
- j) Persistent compatibility problems with the diverse legacy systems of the partners.
- k) Resources not available when desirable
- l) Software fails to meet business needs
- m) System may be over-engineered when compared to the actual requirements.
- n) Technological problems.

20.

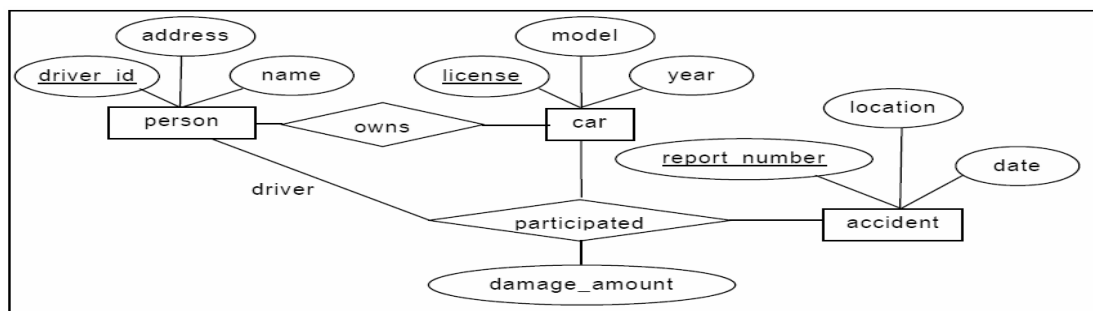
Explain different Approaches to Mapping Systems? (or) what are the techniques for mapping business processes? (N15 MTP1 - 4M, M15 MTP2 - 5M, NOV16 -4M)

1. Accountant do not need to have the ability to program complex systems, but is it important for them to understand the documentation that describes how processing takes place.
2. Documentation includes the flowcharts, narratives and other written communications that describe the inputs, processing and outputs of an Information System.
3. Documentation also describes the logical flow of data within a computer system and the procedures that employees must follow to accomplish application tasks.
4. Some of the reasons why documentation is important are as follows:
 - a) **Depicting how the system works:** Documentation is required to help employees understand how a system works.
 - b) **Training users:** Documentation includes user guides, manuals, and similar operating instructions that helps to train users better.
 - c) **Designing new systems:** Documentation helps to system designers to develop new systems. Well-written documentation plays key roles in reducing errors.
 - d) **Controlling system development and maintenance costs:** Good documentation helps system designers to develop modular, reusable code that further avoids writing duplicate programs.
 - e) **Standardizing communications with others:** standardized tools such as E-R Diagrams, System Flowcharts, and DFDs are useful to communicate with one another about systems.
 - f) **Auditing Information Systems:** Documentation helps auditors determine the strengths and weaknesses of a system's controls.
 - g) **Documenting business processes:** Documentation helps managers better understand how their businesses controls are involved or missing, and how to improve them.
5. Some of the popular pictorial representation or techniques which may be adopted for mapping business processes used are.
 - a) Entity Relationship Diagrams
 - b) Data Flow Diagrams
 - c) Flowcharts (***Refer 6th chapter***)
 - d) Decision Tables
 - e) Decision Trees

21. Explain about Entity Relationship Diagrams?**(N15 - 2M, N15RTP)**

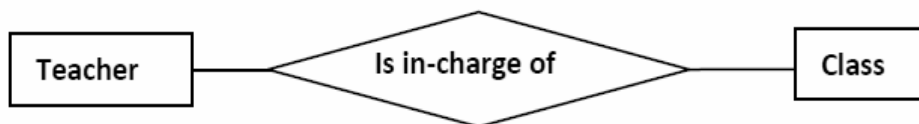
- a) An Entity-Relationship (ER) diagram is a data modeling technique that creates a graphical representation of the entities, and the relationships between entities, within an information system.
- b) An entity may be a 'physical object' such as a house or a car, an 'event' such as a house sale or a car service, or a 'concept' such as a customer transaction or order.
- c) The entity is represented by a rectangle and labeled with a singular noun.
- d) Diamonds are normally used to represent relationships.
- e) A relationship is an association that exists between two entities. For example, Instructor teaches Class or Student attends Class.
- f) The relationships on an ER Diagram are represented by lines drawn between the entities involved in the association.
- g) Ovals are used to represent attributes. An attribute is a data element that describes an entity.

Meaning	Symbol
Entity	
Attribute	
Key Attribute	
Relationship	

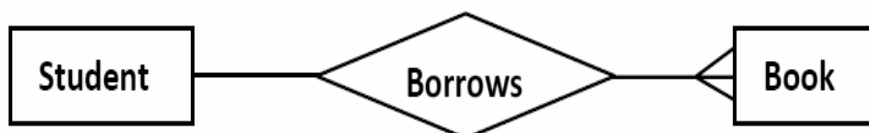
**Fig. 1.9.1: E-R Diagram for Car Insurance Company****22. Explain different types of relationships in Entity Relationship model?****(PM, M15RTP, N14 MTP1 - 4M)**

Relationship: It is defined as an association between two or more entities

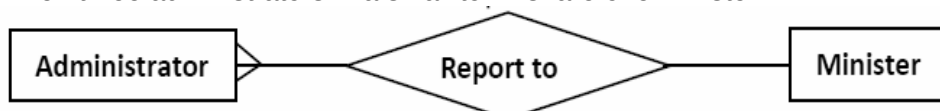
- a) **One-to-One relationship (1:1):** As in a single parent record to a single child record. **Ex:** Each class must be in-charge of by one teacher.



- b) **One-to-Many relationships(1:N):** As in a single parent record to two or more child records – **for example**, A student may borrow some books from the library. **(RTP-N15)**



- c) **Many-to-One relationships (M:1):** As in two or more parent records to a single child record-**for example**, when three administrators in a small town share one minister.



- d) **Many-to-Many relationships (M:N):** As in two or more parent records to two or more child records – **for example**, when two or more students are enrolled in two or more courses.



23. Explain advantages and limitations of E-R Diagrams?

Advantages:

- Simple and easily understandable. It is represented in business users' language and it can be understood by non-technical specialist.
- It helps in Physical Database creation.
- Can be generalized and specialized based on needs.
- Gives a higher level description of the system.

Limitations:

- Physical design derived from E-R Model may have some amount of ambiguities or inconsistency.
- Sometime diagrams may lead to misinterpretations.

24. Write about Data Flow Diagrams and Describe the components of DFD?

(M15 RTP, N15 MTP2-2M, NOV16 - 4M)

- Data Flow Diagram (DFD) is a graphical representation of the flow of data through an information system.
- It shows the technical or business processes with the help of the external data stored, the data flowing from a process to another, and produce results.
- These are partitioned into levels that represent increasing information flow and functional detail.
- It provides a mechanism for functional modeling as well as information flow modeling.

Major components of DFD:

1. **Entity:**

(N14 MTP1 - 1M)

- An entity is the source or destination of data.
- The source in a DFD represents these entities that are outside the context of the system. Entities either provide data to the system (referred to as a source) or receive data from it (referred to as a sink).
- Entities are often represented as rectangles. Entities are also referred to as agents, terminators, or source/sink.

2. **Process:**

- The process is the manipulation or work that transforms data, performing computations, making decisions (logic flow), or directing data flows based on business rules.
- In other words, a process receives input and generates some output. Process names usually describe the transformation, which can be performed by people or machines.*
- Processes can be drawn as circles or a segmented rectangle on a DFD, and include a process name and process number.

3. **Data Store:**

(N14 RTP)

- A data store is where a process stores data between processes for later retrieval by that same process or another one. Files and tables are considered data stores.
- Data stores are usually drawn as a rectangle with the right hand side missing and labeled by the name of the data storage area it represents, though different notations do exist.

4. Data Flow:**(N14 RTP, N15 MTP2-2M)**

- a) Data flow is the movement of data between the entity, the process and the data store.
- b) Data flow represents the interface between the components of the DFD.
- c) Data flow is represented by an arrow, where the arrow is annotated with the data name.

Symbols used in DFD:

Meaning	Symbols
Process	 or 
Data Store	 or 
Entity	
Data Flow	

25. What are the advantages and limitations of Data flow diagrams?**(M15RTP)****Advantages:**

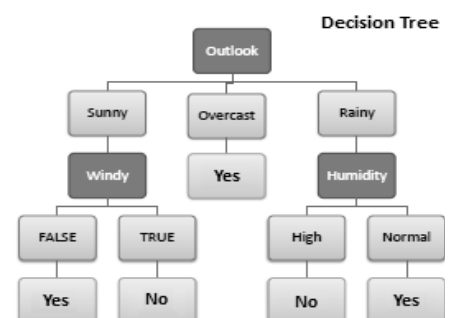
- a) It aids in describing the boundaries of the system.
- b) It is beneficial for communicating existing system knowledge to the users.
- c) Easy to recognize.
- d) Provide a detailed representation of system components.
- e) It is used as the part of system documentation file.
- f) Easier to understand by technical and nontechnical audiences
- g) It supports the logic behind the data flow within the system.

Limitations:

- a) It make the programmers little confusing concerning the system.
- b) Takes long time to create, so the analyst may not receive support from management to complete it.
- c) Physical considerations are left out.

26. Explain about Decision Trees?**(N14 MTP2 - 1M)**

- a) It is also known as inference or logical tree is a collection of a basis (condition) and a conclusion (action).
- b) It is a decision support tool that uses a tree-like model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility .
- c) It is a one way to display an algorithm.
- d) In its tree-like representation, the premises and conclusions are shown as nodes, and the branches of the tree connect the premises and the conclusions.
- e) Decision trees are commonly used in operations research, to help identify a strategy most likely to reach a goal.
- f) Decision Trees are measured to be one of the most accepted approaches for representing classifier.
- g) Decision trees are a simple, but powerful form of multiple variable analyses.
- h) Researchers from a variety of disciplines such as statistics, machine learning, pattern identification and data mining have dealt with the issue of growing a decision tree from available data.



27. Explain the advantages and limitations of Decision trees.**(PM)****Advantages:****(M15 MTP1 - 3M)**

- a) Simple to understand and interpret.
- b) Possible scenarios can be added.
- c) Worst, best and expected values can be determined for different scenarios.

Limitations:

- a) For data including categorical variables with different number of levels, information gain in decision trees are biased in favor of those attributes with more levels.
- b) Calculations can get very complex particularly if many values are uncertain and/or if many outcomes are linked.

28. Explain about Decision Tables?**(N14 - RTP, M15 - RTP, M15 MTP1 - 1M)**

- a) It is a tabular representation of program logic.
- b) Displays all conditions and the appropriate actions to be taken for set of conditions.
- c) In other words, it defines the possible contingencies that may be considered within the program and the appropriate course of action for each contingency.
- d) It is divided into four parts:

Condition Stub	Condition Entries
Action stub	Action Entries

- e) **Condition Stub:** Lists the comparisons or conditions.
- f) **Condition Entries:** Lists in its various columns the possible permutations of answer to the questions in the conditions stub.
- g) **Action Stub:** Lists the actions to be taken along the various program branches.
- h) **Action Entries:** Lists in its columns corresponding to the condition entries the actions contingent upon the set of answers to questions of that column.

29. Explain the advantages and limitations of Decision tables**Advantages:**

- a) **Easy to Draw** – Decision Tables are easy to draw and modify as compared to flowcharts.
- b) **Compact Documentation** – The documentation in the form of decision tables is compact since one decision table may replace few pages of a flowchart.
- c) **Simplicity** – It is easier to follow a particular path in one column of a decision table than it is to go through several pages of the flowcharts.
- d) **Direct Codification** – The decision tables can be directly coded into a program.
- e) **Better Analysis** – A decision table shows various alternatives and their respective outcomes side by side for better analysis of the problem.
- f) **Modularity** – The complex problems would require complex decision tables which can be easily broken down to micro-decision tables.
- g) **Non-technical** – No knowledge of computer language or CPU working is necessary for drawing decision tables.

Limitations:

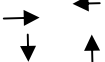
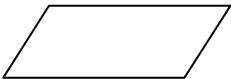
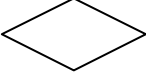
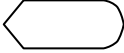
- All programmers may not be familiar with Decision Tables.
- Flowcharts can better represent a simple logic of the system rather than a decision table.
- The decision tables do not express the total sequence of the events needed to solve the problem.

6. FLOWCHARTS**1. Define the term Flowchart. What are the types of Flowcharts?****(M15RTP)**

- A Flowchart is a diagram prepared by the programmer of the sequence of steps involved in solving a problem.
- It is an essential tool for programming and it illustrates the strategy and thread of logic followed in the program.
- A flowchart helps the programmer avoid fuzzy thinking and accidental omissions of intermediate steps.
- Flowcharts are used in analyzing, designing, documenting or managing process or program in various fields.
- Flowcharts may be divided into

Type of Flowchart	Explanation
Document Flowchart	This flowchart traces the physical flow of documents through an organization – that is, the flow of documents from the departments, groups, or individuals who first created them to their final destinations.
System Flowchart	This typically depicts the electronic flow of data and processing steps in an Information System. While Document Flowcharts focus on tangible documents, system flowchart concentrates on the computerized data flows of Information systems.
Program Flowchart	It is most detailed and is concerned with the logical/arithmetic operations on data within the CPU and the flow of data between the CPU on the one hand and the input/output peripherals on the other.

FLOWCHART SYMBOLS:**(N15 MTP1-2M)**

Start/End		Flow Lines	
Input / Output		Decision Box	
Process		Print	
Connectors		Display	

2. Explain the advantages and limitations of Flowcharting.**(PM, N15RTP)****BENEFITS:**

- Quicker grasp of relationships:** The relationship between various elements of the application, lengthy descriptions was depicted diagrammatically.

2. **Effective Analysis:** Acts as a blue print, problems may be identified and new approaches may be suggested.
3. **Communication:** Aid in communicating the facts of a business problem.
4. **Documentation:** Serve as a good documentation which aid greatly in future program conversions.
5. **Efficient coding:** Act as a guide during the system analysis and be checked to ensure that no steps are omitted while coding.
6. **Orderly check out of problem:** They help in detecting, locating and removing mistakes.
7. **Efficient program maintenance:** They help the programmer to concentrate attention on that part of the information flow which is to be modified.

Limitations:

1. **Complex logic:** becomes complex and clumsy where the problem logic is complex.
2. **Modification:** If modifications are required, it may require complete re-drawing.
3. **Reproduction:** Reproduction is often a problem because the symbols used in flowcharts cannot be typed.
4. **Link between conditions and actions:** Sometimes it becomes difficult to establish the linkage between various conditions and the actions.
5. **Standardization:** One single problem can be solved in multiple ways. Hence no standardization. Flowcharts are not such a natural way of expressing procedures as writing in English, nor are they easily translated into Programming language.

THE END