

PAPER – 6 : INFORMATION TECHNOLOGY AND STRATEGIC MANAGEMENT

SECTION – A : INFORMATION TECHNOLOGY

QUESTIONS

1. Define the following terms briefly:

(i) Server	(ii) Cache Memory
(iii) BIOS	(iv) SCSI
(v) USB Connectors	(vi) Address Bus
(vii) Screen Resolution	(viii) Bit Mapping
(ix) Computer Output Microfilm (Microfiche)	(x) Utility Program
(xi) Artificial Intelligence	(xii) Clock Speed
(xiii) Binary Coded Decimal	(xiv) Word
(xv) Data Independence	(xvi) Query Manager
(xvii) Offline Data Warehouse	(xviii) Network Interface Card (NIC)
(xix) MODEM	(xx) Hubs
(xxi) Network Protocols	(xxii) DNS Server
(xxiii) Web Casting	(xxiv) E-mail
(xxv) Credit Cards	
2. Convert the following from one number system to another number system along with the working notes:

(i) $(110011)_2$	=	() ₁₀
(ii) $(255)_{10}$	=	() ₂
(iii) $(325.50)_{10}$	=	() ₂
(iv) $(10011.11)_2$	=	() ₁₀
3. Distinguish between the following:
 - (i) Dynamic RAM and Static RAM
 - (ii) Micro-computer and Workstations
 - (iii) Semi-conductor memory and Bubble memory
 - (iv) Cathode Ray Tube (CRT) and Flat-Panel display
 - (v) Impact Printer and Non-impact printer
 - (vi) Multiprogramming and Multiprocessing

- (vii) Serial File Organization and Sequential File Organization
- (viii) Data Definition Language (DDL) and Data Manipulation Language (DML)
- (ix) Client-server database and Knowledge database
- (x) Circuit Switching and Packet Switching
- (xi) Database Server and Application Server
- (xii) Two Tier systems and Three Tier systems
- (xiii) Network-Node Intrusion Detection (NNID) and Host-based Intrusion Detection (HID)
- (xiv) Business to Business and Business to Consumer E-Commerce
- (xv) Analog / Dial-up Connection and Wireless Internet Connection

Types & Advantages of Computer

4. (a) Discuss various types of computer system based on their working principal.
(b) Discuss in brief, advantages of a computer system.

Primary & Secondary Storage Devices

5. (a) Discuss in brief, various types of storage for storing the data in computers.
(b) What is magnetic tape? Discuss different types of magnetic tapes.

Direct Data Entry

6. What is Direct Data Entry (DDE) ? Discuss in brief, various DDE Devices.

Software

7. (a) What is software? Explain various types of software in brief.
(b) Discuss the advantages and disadvantages of 1st and 2nd generation of computer languages.

Decision Support System

8. (a) What are Decision Support Systems ? Describe various characteristics of a Decision Support System.
(b) Discuss in brief, various components of a Decision Support System.

File Organization

9. (a) Discuss the advantages and disadvantages of Direct File Organization.
(b) Describe various factors which must be considered in determining the best file organization for a particular application.

Database Architecture and Structure

10. (a) Discuss various views of database architecture while designing a database.

- (b) What is Hierarchical database system? Discuss salient features of a Hierarchical database structure.

Backup & Recovery

- 11. (a) What do you understand by backup and recovery of database ? Discuss various issues which are related with backup and recovery of the databases.
- (b) Discuss different core phases that are required in developing a backup and recovery strategy.

Benefits and Classification of Computer Network

- 12. (a) What is a Computer Network? Discuss in brief, benefits of using computer network.
- (b) Discuss various types of computer networks based on the area covered by each of the network.

Network Topology

- 13. What do you understand by Network Topology? Discuss in brief, various network topologies.

Client/Server Architecture

- 14. (a) What is Client/Server architecture ? Discuss the important characteristics of the Client/Server technology.
- (b) Discuss in brief, various components of a Client/Server architecture.

Network Security

- 15. (a) Discuss in brief, various steps involved in implementation of the security program.
- (b) What are the network related threats? Discuss in brief.

Internet & Intranet

- 16. (a) Discuss in brief, applications of the Internet.
- (b) What is Intranet? Discuss key benefits of the Intranet.

Supply Chain Management

- 17. (a) What is Supply Chain Management? Discuss the potential problems which can be addressed through supply chain management.
- (b) Discuss in brief, strategic and competitive areas which can be used to their full advantage if a SCM system is properly implemented.

E-Commerce and its Risk & Security Considerations

- 18. (a) Discuss in brief, step by step processing of an online transaction in e-Commerce environment.

- (b) What are the different tools available to protect information and systems against compromise, intrusion, or misuse?

Flowcharting

19. A car shop in a city hires car by the day at different rates for different models as given below:

Model Name	Hire rate per day (₹)
Honda City	1000
Tata Indica	800
Maruti WagonR	600

In order to attract customers, the car owner gives a discount on the number of days a car is hired for. The policy of discount is as given below:

No. of days	Discount rate (%)
1- 5	0.00
6- 10	10
11 and over	20

For every car hired, a deposit of ₹10000 must be paid.

Develop a flow chart to print out the details for each customer such as name of the customer, car model name, number of days a car is hired for, hire charges, discount and total charges including deposits.

20. Decision Table

- (a) What is Decision Table? Discuss in brief, various components of a decision table in brief.
- (b) Discuss the advantages and disadvantages of a decision table.

SUGGESTED ANSWERS / HINTS

1. (i) **Server:** A server is a computer system that provides services to other computing systems called clients over a network. Server operates continuously on a network and waits for service request from other computers on the network. It provides better access control and can reduce costs by reducing duplication of hardware/software.
- (ii) **Cache Memory:** Processors incorporate a special type of internal memory called cache to boost processing power significantly. Some of the information in the main memory is duplicated in the cache memory which is slightly slower but of much

greater capacity than the processor register and faster but much smaller than main memory. It comes in three types: L₁, L₂ and L₃ Cache.

Or

Cache memory is a high speed memory capable of keeping up with the speed of CPU. It is similar to RAM from the access point of view and acts as a buffer between the CPU and the slower main memory.

- (iii) BIOS : Basic Input Output System is a small chip on the motherboard that loads the hardware settings required to load various devices like keyboards, monitors, or disk drives. It acts an interface between the operating system and the motherboard. It is a boot firmware program that controls the computer from the time we start it up until the operating system takes over. The BIOS also manages data flow between the computer's operating system and attached devices such as hard disk, video card, keyboard, mouse and printer.
- (iv) SCSI: Small Interface System Interface is a device interface that is used to solve the problem of a finite and possibly insufficient number of expansion slots. Instead of plugging interface cards into computer's system bus via the expansion slots, SCSI extends the system bus outside the computer by way of a cable.
- (v) USB Connectors: Universal Serial Bus is a serial communication physical interface through which information transforms in or out one bit at a time. USB connectors provide the user with higher data transfer speeds for different USB devices like keyboard, mouse, scanner or digital camera.
- (vi) Address Bus: The address bus is a set of wires on the mother board that connects the CPU and RAM and carries the addresses of the memory locations where data can be retrieved or stored. Number of parallel wires in the address bus determines the maximum number of memory locations the CPU can address. For example, a 32 bit address bus can address upto 4 GB of memory locations.
- (vii) Screen Resolution: It indicates the degree of detail that can be perceived, which depends on the number of pixels used to display any image. The more pixels that are available to display any image on-screen, the sharper the image is. The higher the resolution, the finer the detail is.
- (viii) Bit Mapping :Display devices that are capable of producing graphics output commonly employ a method called bit mapping. Bit-mapped devices allow each individual pixel on the screen to be controlled by the computer. Thus, any type of image that can be formed from the rectangular grid of dots on the screen is possible. Character-addressable devices are not bit-mapped and partition the screen into standard character widths is used to display the text.
- (ix) Computer Output Microfilm (Microfiche): It is an output technique that records output from a computer as microscopic images on rolls or sheet film. These are the same images, which can be printed on paper. The COM recording process reduces

characters by 24, 42 or 48 times smaller than the normal size produced by the printer. The information is then recorded on sheet film called 16 mm, 35 mm microfilm or 105 mm microfiche.

- (x) **Utility Program:** Utility programs are systems programs that perform general system support tasks. These programs are provided by the computer manufacturers to perform tasks that are common to all data processing installations. Some of them may either be programs in their own right or subordinates to be assembled/compiled in the application programs. Utility programs perform many task such as sorting, scanning, checking, tracing etc.
- (xi) **Artificial Intelligence (AI):** It is software that tries to emulate aspects of human behaviour, such as reasoning, communicating, seeing, and hearing. It is the study and design of intelligent agents that perceives its environment and takes actions that maximize its chances of success. AI includes natural language, voice and visual recognition, robotics, neural networks, and expert systems.
- (xii) **Clock Speed:** The clock speed is the speed at which the processor executes instructions. Clock speed is measured in either in megahertz (MHz)-which is a million cycles per second or in gigahertz (GHz) - which is one-billion cycles per second. Higher the clock's speed, the faster the processor, the better the system performance.
- (xiii) **Binary Coded Decimal:** It is the simplest binary code that is used to represent a decimal number. 4 bits represent a decimal number in BCD codes. The decimal weighing is maintained, but the digit is represented by a combination of the binary digits 0 and 1. Since ten digits 0.....9 have to be represented, a minimum of four bits must be used to encode each digit. Hence, each digit is represented by its binary equivalent using four bits *e.g.*, the digit 5 is equivalent to binary 0101 and the digit 9 is equivalent to binary 1001.
- (xiv) **Word:** A word is a group of bits usually larger than a byte that is transferred as a unit between primary storage and the registers of the ALU and control unit. Thus, a computer with a 32-bit word length might have registers with a capacity of 32 bits, and transfer data and instructions within the CPU in a group of 32 bits. A 32 bit word length computer processes the data faster than 16-bit or 8-bit word length computer.
- (xv) **Data Independence:** It is an ability of a database to modify a schema definition at one level without affecting a schema in the next higher level. Data independence occurs because when the schema is changed at one level, the schema at next level remains unchanged and only the mapping between the two levels is changed. It defines Physical and Logical Data Independence. Physical data independence changes the internal schema without changing the conceptual schema. Logical data independence changes the conceptual schema without changing the external schema.

- (xvi) **Query Manager:** It interprets user's online query and converts to an efficient series of operations in a form it is capable of being sent to data manager. It uses data dictionary to find structure of relevant portion of database and uses information to modify query. It prepares an optimal plan to access database for efficient data retrieval.
- (xvii) **Offline Data Warehouse:** These are data warehouses in which updation of data from the operational systems are done on a regular interval of time such as daily, weekly or monthly. The data in such a warehouse are stored in an integrated reporting-oriented data structure.
- (xviii) **Network Interface Card (NIC):** It is an electronic card which is installed in server as well as in all the nodes for interconnection of nodes with server. Network Interface card provides a connector on its back for connection of nodes and server using network cable. NIC has buffer for storing incoming and outgoing packets, thus improving the network throughput. NIC uses linear bus topology, according to which only one node can access the data from the server at a time. NIC is installed in one of the available PCI/ISA slot on the motherboard.
- (xix) **MODEM:** It stands for Modulator/Demodulator and is an encoding as well as decoding device used in data transmission that converts a digital computer signal into an analog telephone signal (i.e. it modulates the signal) and converts an analog telephone signal into a digital computer signal (i.e. it demodulates the signal) in a data communication system.
- (xx) **Hubs:** A hub is a multi port connecting device that is used to interconnect LAN devices. Each node is connected to the hub by means of simple twisted pair cables that provides a connection over a higher speed link to other LANs, the company's WAN, or the Internet. A hub can be used to extend the physical length of a network. Hubs can be active and passive and supports homogeneous network only.
- (xxi) **Network protocols:** are sets of rules for communicating timings, sequencing, formatting, and error checking for data transmission. It provides standards for data communication. The rules must be adhered to by both the communicating parties to ensure that the information being exchanged between the two parties is received and interpreted correctly. A protocol defines the following three aspects of digital communication namely *Syntax, Semantics and Timing*.
- (xxii) **DNS Server:** Domain Name Services Server is an Internet-wide distributed database system that documents and distributes network specific information such as the associated IP address for a host name, and vice-versa. The host storing this database is a domain name server.
- (xxiii) **Web Casting:** It is a web based technology, which allows users to passively receive broadcast information rather than actively search the web for information. It allows users to choose from a menu of sources, specifying what kind of information is needed.

Once selected, the information is automatically forwarded to the user. E.g. Internet news services.

(xxiv)E-mail: It is a method of composing, sending, storing and receiving messages over electronic communication systems. The term e-mail applies both to the Internet e-mail system based on the Simple Mail Transfer Protocol (SMTP) and to intranet systems allowing users within one company to e-mail each other.

(xxv)Credit Cards: It facilitates the payment of goods and services through electronic means. In a credit card transaction, the consumer presents preliminary proof of his ability to pay by presenting his credit card number to the merchant. The merchant can verify this with the bank, and create a purchase slip for the consumer to endorse. 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.

$$\begin{aligned}
 2. \quad (i) \quad (110011)_2 &= (\quad)_{10} \\
 &= 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 \\
 &= 32 + 16 + 0 + 0 + 2 + 1
 \end{aligned}$$

$$(110011)_2 = (51)_{10}$$

$$(ii) \quad (255)_{10} = (\quad)_2$$

2	255	
2	127	1
2	63	1
2	31	1
2	15	1
2	7	1
2	3	1
2	1	1
	0	1

$$(255)_{10} = (11111111)_2$$

$$(iii) \quad (325.50)_{10} = (\quad)_2$$

To convert the given number from Decimal Number System to Binary Number System, first we will convert mantissa part, then the fractional part into Binary Number System.

Step – I

2	325	
2	162	1
2	81	0
2	40	1
2	20	0
2	10	0
2	5	0
2	2	1
2	1	0
	0	1

$$(325)_{10} = (101000101)_2$$

Step – II

$$.50 \times 2 = 1.0$$

$$(.50)_{10} = (1.0)_2$$

So,

$$(325.50)_{10} = (101000101.1)_2$$

$$\begin{aligned}
 \text{(iv) } (10011.11)_2 &= (\quad)_{10} \\
 &= 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 1 \times 2^{-2} \\
 &= 16 + 0 + 0 + 2 + 1 + 1/2 + 1/4 \\
 (10011.11)_2 &= (19.75)_{10}
 \end{aligned}$$

3. (i) **Dynamic RAM and Static RAM:** Dynamic RAM is the most common type of main memory. It is dynamic because each memory cell loses its charge so it must be refreshed hundreds of times each second to prevent data from being lost.

Static RAM, on the other hand, is a lot faster, larger and more expensive. It is static because it need not be continually refreshed. Because of its speed, it is mainly used in cache memory.

The Static RAM retains the stored data as long as power remains on, whereas in Dynamic RAM the stored information is to be recharged before it disappears.

The power consumption of Dynamic RAM is less than Static RAM. In DRAM, the computer does the refreshing process taking time out from other chores every millisecond.

- (ii) **Micro-computer and Workstations:** A microcomputer is a full-fledged computer system that uses a microprocessor as its CPU. These are also called personal computers.

Workstations look like a personal computer and is typically used by one person. In terms of processing power, workstations are faster than microcomputers but less than minicomputer.

Workstations differ significantly from microcomputers in two areas. Internally, workstations are constructed differently than microcomputers. They are based on different architecture of CPU called Reduced Instruction Set Computing (RISC) which results in faster processing of instructions compared to microprocessor based personal computers. Workstations are generally used by scientists and engineers.

Another difference is that most microcomputers can run on DOS, Windows and Windows NT Operating System whereas workstations generally run on the Unix Operating System or a variation of it.

Although workstations are still more powerful than the average personal computer, the differences in the capabilities of these types of machines are growing smaller.

- (iii) **Semi-conductor memory and Bubble memory:** Semi-conductor memory is made up of very thin silicon chip which contains a number of small storage cells that can hold data. Instead of being made up of a series of discrete components, these units are constructed as integrated circuits, meaning that a number of transistors are integrated or combined together on a thin silicon wafer to form a complete set of circuits. The faster and more expensive bipolar semi-conductor chips are often used in the ALU and high speed buffer storage sections of the CPU, while the slower and less expensive chips that employ metal-oxide semi-conductor technology are used in the main memory section.

On the other hand, **Bubble memory** is composed of small magnetic domains formed on a thin single-crystal film of synthetic garnet. These magnetic bubbles, which are actually magnetically charged cylinders, only a few thousand of a centimetre in size, can be moved across the garnet film by electric charges. The presence or absence of a bubble can be used to indicate whether a bit is 'on' or 'off'. Since data stored in bubble memory is retained when power to the memory is turned off, it can be used for auxiliary storage. Bubble memory has high potential because of its low production costs and its direct access capabilities, thus it may become widely employed as main memory technology. Since it is small, lightweight, and does not use very much power, bubble memory is finding a great deal of use as an auxiliary storage in portable computers.

- (iv) **Cathode Ray Tube (CRT) and Flat-Panel display:** Cathode Ray Tube (CRT) devices use a large tube-type element that looks like the picture tube in a standard TV set. Inside the tube is a gun that lights up the phosphorescent pixels on the

screen surface. CRT technology is relatively inexpensive and reliable. CRT-type display devices are rather bulky and limited in the resolution that they provide.

Flat-Panel, display is uses either a liquid crystal display (LCD) or gas-plasma technology. To form images, LCD devices use crystalline materials sandwiched between two panes of glass. When heat or voltage is applied, the crystals line up. This prevents light from passing through certain areas and produces the display. Gas-plasma displays, which provide better resolution but are more expensive than liquid crystal displays, use gas trapped between glasses to form images. The biggest advantage of flat-panel displays is that they are lightweight and compact. This makes them especially useful for laptop, notebook, and pocket personal computers.

- (v) **Impact Printer and Non-impact printer:** Impact printers can be described as printers which utilize some form of striking device to transfer ink from an inked ribbon onto the paper being printed to form images or characters. The characters printed are formed either distinct, whole alphanumeric images produced by a process known as full character or formed character printer or, they are formed by a dot matrix method which arranges a series of dots to assume the shape of each character being printed. They are much slower and produces low quality prints than non-impact printer.

Non-impact printers: A non-impact printer produces the output on a paper without striking the paper. They use various technologies like electro static, chemicals, ink jet and thermal for document printing. They form characters by chemical or electronic means. They can produce both text and graphics and are faster than impact printer. They do not produce noise during printing. The laser printer produces very high quality prints from a wide selection of character fonts.

- (vi) **Multiprogramming and Multiprocessing:** Multiprogramming is defined as execution of two or more programs that all reside in primary storage. Since CPU can execute only one instruction at a time, it cannot simultaneously execute instructions from two or more programs. However, it can execute instruction from one program then from second program and so on. This type of processing is referred to as concurrent execution. It is very useful as most of the time, CPU remains idle waiting for Input/Output devices to complete their job, as Input/Output devices are very slow. When Input/Output devices are working for one program, CPU executes instructions of second program. Thus, multiprogramming is a technique which helps in utilising a computer system more effectively. It is a module, which is available in an operating system.

Multiprocessing: On other hand, it refers to the use of two or more central processing units linked together to perform coordinated work simultaneously. Instructions are executed simultaneously because the available CPUs can execute different instructions of the same program or of different programs at any given

time. It is also called parallel processing and job can be processed more rapidly than on a single machine. Multiprocessing offers data processing capabilities that are not available when only one CPU is used. Many complex operations can be performed at the same time. Multiprocessing is used for nation's control applications such as rail, road control, airways and traffic control etc.

- (vii) **Serial File Organization and Sequential File Organization:** In serial file organization, records are arranged one after another, in no particular order other than, the chronological order in which records are added to the file. Serial file organization is commonly found with transaction data, where records are created in a file in the order in which transactions take place. Serial file organization provides advantages like fast access to next record in sequence, cheap storage media and easy to do file backup facility. The updation can be done very slowly in this file organization. Records in a serially organized file are sometimes processed in the order in which they occur.

In **sequential file organization**, records are stored one after another in an ascending or descending order determined by the key field of the records. Sequentially organized files that are processed by computer systems are normally stored on storage media such as magnetic tape, punched paper tape, punched cards, or magnetic disks. To access these records, the computer must read the file in sequence from the beginning. The first record is read and processed first, then the second record in the file sequence, and so on. To locate a particular record, the computer program must read in each record in sequence and compare its key field to the one that is needed. The retrieval search ends only when the desired key matches with the key field of the currently read record. On an average, about half the file has to be searched to retrieve the desired record from a sequential file.

- (viii) **Data Definition Language (DDL) and Data Manipulation Language (DML) :** Data Definition Language is used to create a link between logical and physical structure of database file. Logical refers to the way the user views the data and physical refers to the way the data is stored on the storage media. Overall logical view of the data is called Schema and particular application view is called Sub-schema. DDL defines the field name and data type of each field. It indicates the keys of record i.e. Primary, Secondary and Foreign key and defines data security restrictions i.e. the passwords and access rights of various users. It provides for Logical and Physical data independence and defines means for associating the related records of different files.

On the other hand, **Data Manipulation Language (DML)** provides the techniques for processing the data stored in database files. It provides the techniques for data manipulation such as insertion, deletion and updation of records and enables the user and application programs to process the data on logical basis rather than physical location basis. DML supports various high level programming languages like COBOL, PL/1, C++ etc. thus providing programming languages independence.

It allows the user and application programmers to be independent of physical data structure and physical data structure maintenance and also provides for use of record relationship which is defined using the DDL.

- (ix) **Client-server database and Knowledge database:** Client-server database is designed in a structure whereby one system can connect to another system to ask question or instruct it to perform a job. The system that asks the questions and issues the instructions is the client and the system answering the queries and responding to the instructions is the server. The client machine contains the user interface logic, business logic and the database logic and the server machine contains the database. Both are coupled with a network of high bandwidth. The computational functions are shared in such a way that the server does all such higher level functions which it alone can do leaving the client to perform low level functions. The system is scalable i.e. as much as clients may be added or removed and the shared resources may be relocated to a larger and faster server or to multiple servers. The client server model uses tier architecture where client tier is responsible for data presentation, receiving user events and controlling the user interface, application tier handles the business logic, protecting the data from direct access by the clients and data server tier is responsible for data storage.

A knowledge database system provides functions to define, create, modify, delete and read data in a system. The type of data maintained in a database system historically has been declarative data describing the static aspects of the real world objects and their associations. A database system can also be used to maintain procedural data describing the dynamic aspects of the real world objects and their associations, for example, several amended versions of enactments in the field of labour laws to facilitate management decisions in pay negotiations. When both the declarative and procedural data are stored in a database, it constitutes a knowledge database with more powerful data maintenance.

- (x) **Circuit Switching and Packet Switching**

S. No.	CIRCUIT SWITCHING	PACKET SWITCHING
1	A dedicated path is used throughout the data transmission.	Each packet is transmitted through different routes.
2	It is more reliable because of the availability of a circuit dedicated for a session.	It is relatively less reliable.
3	It is old and expensive.	It is more modern and less expensive.
4.	The data transmission rate is lower.	The data transmission rate is higher.
5.	There is no error checking and flow control mechanism.	It determines the error checking and flow control of data packets at the receiving end.

- (xi) **Database Server and Application Server:** Database Server allows the user interface software to run on each user's PC (the client), and running the database engine in a separate machine (the database server) shared by all users. This approach can increase database performance as well as overall LAN performance because only selected records are transmitted to the user's PC, not large blocks of files. Database servers offer real potential for remote database access and distributed databases. Because the database server only returns selected database record(s) to the client machine (instead of large blocks of data), remote access over relatively slow telephone lines can provide acceptable performance. In addition, a client computer can make requests of multiple servers regardless of physical location.

Application Server is a server program that resides in the server (computer) and provides the business logic for the application program. The server can be a part of the network, more precisely the part of the distributed network. The server program is a program that provides its services to the client program that resides either in the same computer or on another computer connected through the network. Application servers are mainly used in Web-based applications that have 3-tier architecture. The application server is a second/middle tier of the three-tier architecture. In other words, application servers are now an integral part of the three-tier architecture.

- (xii) **Two Tier systems and Three Tier systems:** A two-tier system consists of a client and a server. The database is stored on the server, and the interface used to access the database is installed on the client. Processing management is split between the user system interface environment and the database management server environment. The database management server provides stored procedures and triggers. The two-tier architecture is intended to improve usability by supporting a forms-based, user-friendly interface. It improves scalability by accommodating upto approx. 100 users and improves flexibility by allowing data to be shared, usually within a heterogeneous environment. The two-tier architecture requires minimal operator intervention, and is frequently used in non-complex, non-time critical information processing systems. In this type of architecture, the business logic and the presentation layer is located on the client machine and the data layer is on the server machine. If the number of clients connecting to the sever are many then the server will be overloaded and this will make processing each client request very slow .The two tier design allocates the user system interface exclusively to the client. It places database management of the server and splits the processing management between client and server, creating two layers. It is extensively used in non-time critical information processing where management and operations of the systems are not complex. This design is used frequently in Decision Support system where the transaction load is light.

In three tier systems, the application server tier works in between the data server tier and the client tier. The tiers are bound together logically and can run on the

same physical machine. This middle tier provides process management where business logic and rules are executed and can accommodate hundreds of users (as compared to only 100 users with the two-tier architecture) by providing functions such as queuing, application execution, and database staging. The third tier provides database management functionality and is dedicated to data and file services that can be optimized without using any proprietary database management. The three tier architecture is used when an effective distributed client/server design is needed that provides increased performance, flexibility, maintainability, reusability and scalability, while holding the complexity of distributed processing from the user. Client-tier is responsible for the presentation of data, receiving user events and controlling the user interface. Application-server-tier is responsible for all the business logic. This tier protects the data from direct access by the clients. Data-server-tier is responsible for data storage.

- (xiii) **Network-Node Intrusion Detection (NNID) and Host-based Intrusion Detection (HID):** Network-Node Intrusion Detection is developed to work around the inherent flaws in traditional NID. Network-node pulls the packet-intercepting technology of the wire and puts it on the host. With NNID, the "packet-sniffer" is positioned in such a way that it captures packets after they reach their final target, the destination host. The packet is then analyzed just as if it were traveling along the network through a conventional "packet-sniffer." Network-node is simply another module that can attach to the HID agent. It only evaluates packets addressed to the host on which it resides. Traditional network intrusion detection, on the other hand, can monitor packets on an entire subnet. The advantage to NNID is its ability to defend specific hosts against packet-based attacks in these complex environments where conventional NID is ineffective.

Host-based Intrusion Detection (HID) systems are designed to monitor, detect, and respond to user and system activity and attacks on a given host. Some more robust tools also offer audit policy management and centralization, supply data forensics, statistical analysis and evidentiary support, and in certain instances provide some measure of access control. HID is concerned with what occurs on the hosts themselves. It is best suited to combat internal threats.

- (xiv) **Business to Business and Business to Consumer E-commerce:** Business-to-Business e-commerce is the exchange of services, information and/or products from one business to another, as opposed to between a business and a consumer. Business-to-business electronic commerce (B2B) typically takes the form of automated processes between trading partners and is performed in much higher volumes than business-to-consumer (B2C) applications. It can also encompass marketing activities between businesses, and not just the final transactions that result from marketing. It is also used to identify sales transactions between businesses.

Business-to-consumer e-commerce is the exchange of services, information and/or products from a business to a consumer, as opposed to between one business and another. Business-to-consumer electronic commerce (B2C) is a form of electronic commerce in which products or services are sold from a firm to a consumer. It minimizes internal costs created by inefficient and ineffective supply chains and creates reduced end prices for the customers. Direct Sellers and Online Intermediaries are two types of B2C e-commerce.

- (xv) **Analog / Dial-up Connection and Wireless Internet Connection:** Analog / Dial-up Connection also called dial-up access which is both economical and slow. By using modem, users can connect to the Internet by dialing a phone number which is provided by the Internet Service Provider (ISP). Dial-up is an analog connection because data is sent over an analog, public telephone network. The modem converts received analog data to digital and vice-versa. Because dial-up access uses normal telephone lines the quality of the connection is not always good and data rates are limited. Typical Dial-up connection speeds range from 2400 bps to 56 Kbps.

Wireless Internet Connections: Wireless Internet or wireless broadband is one of the newest Internet connection types. Instead of using telephone or cable networks for Internet connection, it uses radio frequency bands. Wireless Internet provides an always-on connection which can be accessed from anywhere within a network coverage area. Wireless access is quite a new technology and is considerably growing very fast. It is typically more expensive and mainly available in metropolitan areas.

4. (a) On the basis of working principals of computers, they can be categorized into Analog, Digital and Hybrid computers. These are briefly discussed below.
- (i) **Analog Computer:** An analog computer is a form of computer that uses continuous physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved. It is different from the digital computer in that it can perform numerous mathematical operations simultaneously. It is also unique in terms of operation, as it utilizes continuous variables for the purpose of mathematical computation.
 - (ii) **Digital Computer:** It is a computer system that performs calculations and logical operations with quantities represented as digits, usually in the binary number system. A digital computer is designed to process data in numerical form; its circuits perform directly the mathematical operations of addition, subtraction, multiplication, and division. The numbers operated on by a digital computer are expressed in the binary system; binary digits, or bits, i.e. 0 and 1, so that 0, 1, 10, 11, 100, 101, etc., correspond to 0, 1, 2, 3, 4, 5, etc. Binary digits are easily expressed in the computer circuitry by the presence (1) or absence (0) of a current or voltage. A digital computer can store the results of

its calculations for later use and compare results with other data. On the basis of such comparisons it can change the series of operations it performs.

- (iii) **Hybrid Computer:** It is a combination of computers capable of inputting and outputting in both digital and analog signals. Hybrid computer is a digital computer that accepts analog signals, converts them to digital and processes them in digital form. This integration is obtained by digital to analog and analog to digital converter. A hybrid computer may use or produce analog data or digital data. It accepts a continuously varying input, which is then converted into a set of discrete values for digital processing. A hybrid computer system setup offers a cost-effective method of performing complex simulations. A hybrid computer is capable of doing real-time solution and is less expensive than any equivalent digital computer. Hybrid Machines are generally used in scientific applications or in controlling industrial processes.
- (b) Advantages of Computer Systems are discussed below.
- (i) **Speed:** The computer is a very high speed electronic device. The operations on the data inside the computer are performed through electronic circuits according to the given instructions. It can perform millions of operations in one second. The computer generates signals during the process. The speed of computer is usually measure in mega hertz (MHz) or gega hertz (GHz). It means million cycles units of frequency per second.
 - (ii) **Accuracy:** In addition to being very fast, computer is also very accurate device. It gives accurate output result provided that the correct input data and set of instructions are given to the computer. If input data is incorrect then the resulting output will be incorrect. In computer terminology it is known as garbage-in garbage-out.
 - (iii) **Reliability:** The electronic components in modern computer has very low failure rate. The modern computer can perform very complicated calculations without creating any problem and produces consistent (reliable) results.
 - (iv) **Storage:** A computer has internal storage (memory) as well as external or secondary storage. In secondary storage, a large amount of data and programs (set of instructions) can be stored for future use. The stored data and programs are available any time for processing.
 - (v) **Automation:** A computer can automatically perform operations without interfering the user during the operations. It controls automatically different devices attached with the computer. It executes automatically the program instructions one by one.
 - (vi) **Versatility:** Versatile means flexible. Modern computer can perform different kind of tasks one by one or simultaneously. At one moment user can play games on computer, the next moment user can compose and send emails etc.

- (vii) **Communications:** Today computers are mostly used to exchange messages or data through computer networks all over the world. For example the information can be received or send through the Internet with the help of computer. It is most important feature of the modern information technology.
 - (viii) **Diligence:** A computer can continually work for hours without creating any error. It does not get tired while working after hours of work it performs the operations with the same accuracy as well as speed as the first one.
 - (ix) **No Feelings:** Computer is an electronic machine which does not have feelings. It detects objects on the basis of instructions given to it. Based on our feelings, taste, knowledge and experience, we can make certain decisions and judgments in our daily life. On the other hand, computer cannot make such judgments at its own. Their judgments are totally based on instructions given to them.
 - (x) **Consistency:** People often have difficulty to repeat their instructions again and again. Computer can repeat actions consistently (again and again) without losing its concentration. A computer will carry out the activity with the same way every time.
 - (xi) **Precision:** Computers are not only fast and consistent but they also perform operations very accurately and precisely. For example, in manual calculations and rounding fractional values, the value with decimal point can change the actual result. In computer however, we can keep the accuracy and precision upto the level that we desire. The lengthy calculations remain always accurate.
5. (a) Various types of data storage in computers are discussed below.
- (i) **Primary storage:** Primary storage is directly connected to the central processing unit of the computer. It typically consists of three kinds of storage:

Processor registers are internal to the central processing unit. Registers contain information that the arithmetic and logic unit needs to carry out the current instruction. They are technically the fastest of all forms of computer storage, being switching transistors integrated on the CPU's silicon chip, and functioning as electronic "flip-flops".

Main memory contains the programs that are currently being run and the data on which the programs are operating. The arithmetic and logic unit can very quickly transfer information between a processor register and locations in main storage, also known as a "memory addresses".

Cache memory is a special type of internal memory used by many central processing units to increase their performance or "throughput". Some of the information in the main memory is duplicated in the cache memory, which is slightly slower but of much greater capacity than the processor registers, and faster but much smaller than main memory.

- (ii) **Secondary Storage:** Secondary storage requires the computer to use its input/output channels to access the information, and is used for long-term storage of persistent information. Secondary storage is also known as "mass storage", is typically of much greater capacity than primary storage (main memory), but is very much slower. In modern computers, hard disks are usually used for mass storage. The time taken to access a given byte of information stored on a hard disk is typically a few thousandths of a second, or milliseconds. By contrast, the time taken to access a given byte of information stored in random access memory is measured in thousand-millionths of a second, or nanoseconds. It mainly consists of three kinds of storage.

Tertiary storage is a system where data storage is done offline according to the computer operating system's demands. It is primarily used for archival of rarely accessed information and large data storage since it is much slower than secondary storage. Tertiary storage is used in the realms of enterprise storage and scientific computing on large computer systems and business computer networks.

Off-line storage is a system where the storage medium can be easily removed from the storage device. Off-line storage is used for data transfer and archival purposes. In modern computers, floppy disks, optical discs and flash memory devices including "USB drives" are commonly used for off-line mass storage purposes.

Robotic storage is a new type of storage method used for backups and for high capacity archives in imaging, medical, and video industries. It has number of slots, each holding individual media to build-in drives.

- (iii) **Network Storage:** A network storage system helps organize and save critical information created on a computer in an efficient and accessible manner. Network storage arguably allows to centralize the information management in an organization, and to reduce the duplication of information. Network storage includes consists of three types of storage.

Direct Attached Storage (DAS): It refers to a network storage system on which data is saved to the server computer's internal hard drive. The network workstations access the server to connect to the storage. These files are saved directly onto the computer's disk space and can be readily pulled up at any time. This is the most commonly used means of network storage. The disadvantages of DAS include its inability to share data or unused resources with other servers.

Network Attached Storage (NAS): It is a type of network storage system that saves data onto another computer system attached to a group of computers through a network, or onto a special server attached to the network. A NAS device is typically a standalone, high performance, single purpose system or

component. It serves specific storage needs with its own operating system and integrated hardware and software. NAS devices are well suited to serve heterogeneous networks. The advantages of NAS over other methods of storage are performance and connectivity.

Storage Area Network (SAN): It is an architecture that attach remote computer data storage devices (such as disk arrays, tape libraries, and optical jukeboxes) to servers so the devices appear as locally attached to the operating system. A SAN typically has its own network of storage devices that are generally not accessible through the regular network by regular devices. SAN reduces data traffic and improves data access by using Fiber connections.

- (b) Magnetic Tape is an external storage device that can be used for making copies of audio, video, and data. In addition to data storage, magnetic tape has been used over the years to make master copies of audio recordings that would be replicated for vinyl, cassette, and more recently compact disk recording formats. The tape is employed with the use of a machine referred to as a tape drive that stores the computer data on magnetic tape. A tape drives run the magnetic tape during the recording process and also stores the tape onto a reel for easy retrieval. Its biggest drawback is that it can only access data sequentially. However, many data processing operations are sequential or batch oriented in nature, and tape is still economical. The two most popular forms of magnetic tape used for large system MIS applications are detachable reel magnetic tapes and tape cartridges.
- (i) **Detachable Reel Magnetic Tapes** are used with mainframes and minicomputers. These tapes are stored on detachable reels. These plastic tapes are, like disks, coated with a magnetizable surface (often iron oxide) that can be encoded with 0 and 1 bits. A 2,400 feet reel of ½ inch diameter tape packs data at 6,250 bytes per inch. Recording densities of tapes are often cited as bytes per inch (bpi) because in most instances, a character (byte) is represented as a vertical slice of bits across the tracks of tape surfaces. Tapes are read on a hardware device called a tape unit. The tape is processed by passing it under read/write heads located between the two reels. Depending on the instructions given to the computer system, data can then either be read from the tape or written to it. It uses 9 parallel tracks to store data.
- (ii) **Tapes Cartridge Systems** represent the leading edge of tape technology. Tape cartridges are available for both large and small computer systems. Tape cartridges for microcomputer systems, which resemble cassette tapes in appearance, are frequently used to back up hard disks. These tapes, which are not designed for processing purposes, are sometimes called streaming tapes. The capacities of these tapes vary, but several megabytes of storage are typical. Streaming tapes can usually back up the contents of a hard disk in a few minutes. These ½ inch tapes store data in 18 tracks.

6. Direct Data Entry (DDE) refers to entry of data directly into the computers through machine readable source documents. It does not require manual transcription of data from original paper documents. These devices can scan source documents magnetically or optically to capture data for direct entry into the computer. Magnetic Ink Character Readers and Optical Character Readers are few examples of such devices. The followings are the most common DDE devices.
- (i) **Magnetic Ink Character Recognition (MICR):** MICR employs a system of printed characters which are easily decipherable by human beings as well as a machine reader. These character recognition techniques use special printing font to represent characters. Each character is basically composed of vertical bars and printed in special ink, containing magnetizable material. When a character is subsequently read it is passed beneath a reading head and big and small gaps send in different types of impulses represented by 1 bit and 0 bit respectively. The use of magnetic printing allows the characters to be read reliably even if they have been overprinted or obscured by other marks, such as cancellation stamps. This method is primarily used in banking industry, and most cheques are now processed under the MICR approach. The data printed across the bottom of a blank cheque are recorded in MICR form; the characters represent the bank on which the cheque is drawn, the customer's account number and the amount of the cheque.
 - (ii) **Optical Character reading (OCR):** OCR employs mechanical or electronic translation of scanned images of handwritten, typewritten or printed text into machine-encoded text. The printing characters with standard font can be read by both human and machine readers. The machine reading is done by light scanning techniques in which each character is illuminated by a light source and the reflected image of the character is analysed in terms of the light-dark pattern produced. OCRs can read upper and lower case letters, numerals, and certain special characters from handwritten, typed and printed paper documents. The specific characters that can be read and whether the characters must be handwritten, typed or printed depend upon the type of OCR being used. OCR annihilates the time consuming step of transcription. Large volume billing applications (e.g. the bills of utility companies, credit card organizations, and magazine subscriptions etc.) increasingly are being adapted to OCR methods. It is also widely used to convert books and documents into electronic files, to computerize a record-keeping system in an office, or to publish the text on a website. Through OCR, it is possible to edit the text, search for a word or phrase, store it more compactly, display or print a copy free of scanning artefacts, and apply techniques such as machine translation, text-to-speech and text mining to it.
 - (iii) **Optical Mark Recognition (OMR):** It is the process of capturing human-marked data from document forms such as surveys and tests. Optical marks are commonly used for scoring tests. The optical mark reader when on-line to the computer systems can read up to 2,000 documents per hour. OMR can also be used for such

applications as order writing, payroll, inventory control, insurance, questionnaires, etc. Earlier, OMR systems were designed to use dedicated scanners and special pre-printed forms with drop-out colors and registration marks. But today, OMR software makes OMR possible on a desktop computer by using an image scanner to process surveys, tests, attendance sheets, checklists, and other plain-paper forms printed on a laser printer. The use of OMR is not only limited to schools or data collection agencies; many businesses and health care agencies use OMR to streamline their data input processes and reduce input error. OMR provides a fast, accurate way to collect and input data; however, it is not suited for everyone's needs. As a result of the widespread adoption and ease of use of OMR, standardized examinations consist primarily of multiple-choice questions, changing the nature of what is being tested.

- (iv) **Smart Card Systems:** Smart cards resemble credit cards in size and shape and have an embedded microchip instead of magnetic strip. The chip contains all the information a magnetic strip contains but offers the possibility of manipulating the data and executing applications on the card. Smart cards are used most frequently to make electronic purchases and to electronically transfer funds between accounts. However, the potential applications for these are abound. For example, in the health care industry, smart cards could be used to store the holder's identity, address, insurance data, relatives' details, allergies, and even a brief medical history. Smart cards could also be used for security applications. For example, a card could contain the digitized fingerprint of the cardholder, which could be compared at a security checkpoint to fingerprints of people who are authorized to enter a secured area.
 - (v) **Bar Code Reader:** It is a device which converts the bar - a pattern of printed bars on products, into a product number by emitting a beam of light – frequently a laser beam – that reflects off the bar code image. A light-sensitive detector identifies the bar code image by recognizing special bars at both ends of the image. Once the detector has identified the bar code, it converts the individual bar patterns into numeric digits. It is the most widely used input device after the keyboard and mouse commonly found in supermarkets and departmental stores. After the bar code reader has converted a bar code image into a number, it feeds that number to the computer, just as though the number had been typed on a keyboard. Bar codes provide the advantages of improved accuracy of data entry, better customer service through faster checkout at the point of sale, and greater control and reliability of inventory records. They are used in industries and organizations that must count and track inventory, such as retail, medical, libraries, military and other government operations, transportation facilities, and the automobile industry.
7. (a) A computer software is the collection of computer programs and related data that provide the instructions to the computer to perform task given by the user. There are basically three types of software: Systems software, Applications software and

General-purpose software.

- (i) **Systems Software:** System software is computer software designed to operate the computer hardware and to provide and maintain a platform for running application software. Therefore, system software may be defined as a set of one or more programs designed to control the operation of computer system. It is an essential part of the computer system. It comprises of those programs that control and support the computer system and its data processing applications. It includes the following:
 - Programming Languages
 - Operating Systems
 - Device Drivers
 - Utility Programs
 - Language Translators
 - (ii) **Application Software:** Application software is a subclass of computer software that employs the capabilities of a computer directly to a task that the user wishes to perform. The program usually solves a particular application or problem that is unique to that organization. Examples of such programs are Payroll, General accounting, Sales statistics and Inventory control etc.
 - (iii) **General-purpose Software:** This software provides the framework for a great number of business, scientific, and personal applications. Spreadsheet, Databases, Computer-Aided Design (CAD) and Word processing software etc. fall into this category. Most general-purpose software is sold as a package. The software is accompanied by user-oriented documentation such as reference manuals, keyboard templates, and so on. Commercial, Shareware and Open Source software are most general purpose software used now days.
- (b) Advantages and Disadvantages of 1st generation of computer language i.e. Machine language are discussed below.

Advantages

The only advantage is that program of machine language run very fast because no translation program is required for the CPU.

Disadvantages

- It is very difficult to do programming in machine language. The programmer has to know details of hardware to write program.
- The programmer has to remember a lot of codes to write a program which results in program errors.
- It is difficult to debug the program.

Advantages and Disadvantages of 2nd generation of computer language i.e. assembler language are discussed below.

Advantages

- The symbolic programming of assembly language is easier to understand and saves a lot of time and effort of the programmer.
- It is easier to correct errors and modify program instructions.
- Assembly Language has the same efficiency of execution as the machine level language. Because this is one-to-one translator between assembly language program and its corresponding machine language program.

Disadvantages

- One of the major disadvantages is that assembly language is machine dependent. A program written for one computer might not run in other computers with different hardware configuration.
- An assembler language programmer will normally have to write a large number of statements to solve a given problem than will a programmer using other high-level programming languages.
- Also, because of the concise symbolic notation used in assembler language, assembler language programs are often more difficult to write, read and maintain than programs written in high-level languages.
- Assembler languages are not normally used to write programs for generalized business application software such as payroll, account receivable, billing, and similar applications. Other languages are available that are more appropriate for programming these types of applications.

8. (a) Decision Support Systems (DSS) are information processing systems used by accountants, managers, and auditors to assist them in the decision-making process. Advances in hardware technology, interactive computing design, graphics capabilities, and programming languages contributed to DSS because of which they are used in accounting and auditing today.

The common characteristics of Decision Support Systems are mentioned below.

- (i) DSS support management decision making –These enhance decision quality. While the system might not point to a particular decision, it is the user who ultimately makes the final choice.
- (ii) DSS solve relatively unstructured problems – The unstructured problems with lesser well-defined questions do not have easy solution procedures and therefore need some managerial judgment. Such problems can be handled and addressed with the help of appropriate DSS.

- (iii) **DSS are friendly computer interface** – A friendly computer interface is also a characteristic of a DSS. As the managers and other decision makers using DSS are not necessarily good programmers, such systems must be easy to use. The communication between the user and the DSS is made easy through nonprocedural modeling languages.
 - (iv) **DSS should be able to respond quickly to the changing needs of the decision makers**– As managers must plan for future activities, they rely heavily on assumptions. Any DSS should address the decision making for a variety of assumptions. A key characteristic of many systems is that these allow users to ask what-if questions and examine the results of these questions.
- (b) **Components of a DSS:** A decision support system has four basic components: (i) The users, (ii) Database, (iii) Planning language, and (iv) Model base.
- (i) **The users:** The user of a Decision Support System (DSS) is usually a manager with an unstructured or semi-structured problem to solve. In fact, user does not require a computer background to use a DSS for problem solving. He must have thorough understanding of the problem and the factors to be considered in finding a solution.
 - (ii) **Database:** DSS includes one or more databases. These databases contain both routine and non-routine data from both internal and external sources. The data from external sources include data about economic condition, market demand for goods and services and industry competition, whereas internal data includes data from the financial and managerial accounting system, marketing, production and personnel department.
 - (iii) **Planning language:** Two types of planning languages are commonly used in DSS.
 - **General Purpose:** These languages allow user to perform many routine tasks viz., retrieving various data from a database or performing statistical analysis, budgeting, forecasting and worksheet oriented problem. The languages used in most of the spread sheets are the good examples.
 - **Special purpose:** Special purpose planning languages are statistical languages viz., SAS, SPSS and Mini Tab. These languages perform statistical and mathematical operations.
 - (iv) **Model Base:** The model base is the brain of the decision support system because it performs data manipulation and computations with the data provided to it by the user and database. Model base is custom developed model that does some types of mathematical functions viz., cross-tabulation, regression analysis, time series analysis, linear programming and financial computation. The analysis provided by the routines in the model base is the

key to supporting the user's decision.

9. (a) Advantages of Direct File organization are discussed below.
- (i) The access to, and retrieval of a record is quick and direct. Any record can be located and retrieved directly in a fraction of a second without the need for a sequential search of the file.
 - (ii) Transactions need not be sorted and placed in sequence prior to processing.
 - (iii) Accumulation of transactions into batches is not required before processing them. They may be processed as and when generated.
 - (iv) It can also provide up-to-the minute information in response to inquiries from simultaneously usable online stations.
 - (v) If required, it is also possible to process direct file records sequentially in a record key sequence.
 - (vi) A direct file organization is most suitable for interactive online applications such as airline or railway reservation systems, teller facility in banking applications, etc.

Disadvantages of Direct File organisation are discussed below.

- (i) Address generation overhead is involved for accessing each record due to hashing function.
 - (ii) It may be less efficient in the use of storage space than sequentially organized files.
 - (iii) Special security measures are necessary for online direct files that are accessible from several stations.
- (b) Factors to be considered for best file organization are briefly discussed below.
- (i) **File Volatility:** It refers to the number of additions and deletions to the file in a given period of time. A file that constantly keeps changing is a highly volatile file. An Indexed-sequential file organization will not be suitable for such files, because additions have to be placed in the overflow area and constant reorganization of the file would have to occur. Other direct access methods would be a better choice. Even the sequential file organization could be appropriate if there are no interrogation requirements.
 - (ii) **File Activity:** It is the proportion of master file records that are actually used or accessed in a given processing run. At one extreme is the real-time file where each transaction is processed immediately and hence at a time, only one master record is accessed. This situation obviously requires a direct access method. At the other extreme is a file, such as a payroll master file, where almost every record is accessed when the weekly payroll is processed. In such case, a sequentially ordered file would be more efficient.

- (iii) **File Interrogation:** It refers to the retrieval of information from a file. When the retrieval of individual record needs to be fast to support a real-time operation such as airline reservation, then some direct organization would be required. But if requirements of data can be delayed, then all the individual requests or information can be batched and run in a single processing run with a sequential file organization.
 - (iv) **File Size:** Large files that require many individual references to records with immediate response must be organized for certain direct access method. However, with small files, it may be more efficient to search sequentially or with more efficient binary search, to find an individual record.
10. (a) The following three views are taken into account, while designing the architecture of a database.
- (i) External view (User View)
 - (ii) Conceptual (Global view)
 - (iii) Internal View (Physical view)
- (i) **External view (User View)** encircles the following:
- It is at the highest level of the database abstraction.
 - It includes only those portions of database or application programs which are of concern to the users.
 - It is described by means of a scheme, called the external schema.
 - It is defined by the users or written by the programmers.
- (ii) **Conceptual (Global view)** which is viewed by the Data Base Administrator, encompasses the following.
- All database entities and relationships among them are included.
 - Single view represents the entire database.
 - It is defined by the conceptual schema.
 - It describes all records, relationships and constraints or boundaries.
 - Data description to render it independent of the physical representation.
- (iii) **Internal View (Physical view)** contains the following:
- It is at the lowest level of database abstraction.
 - It is closest to the physical storage method.
 - It indicates how data will be stored.
 - It describes data structure.

- It describes access methods.
 - It is expressed by internal schema.
- (b) In a hierarchical database, records are logically organized into hierarchy of relationship. It is arranged in an inverted tree pattern. All records in hierarchy are called nodes and each node is related to the others in a parent-child relationship. Each parent record may have one or more child records, but no child record may have more than one parent record. Thus, the hierarchical data structure implements one-to-one and one-to-many relationships. The top parent record in the hierarchy is called the *root record* and records that "own" other records are called *parent records*.

The following are the salient features of Hierarchical database.

- (i) Database structure is less flexible as relationships between records are relatively fixed by the structure.
 - (ii) It requires that hierarchy of records must be determined and implemented before a search.
 - (iii) Ad-hoc queries are difficult and time consuming to accomplish.
 - (iv) Frequent management queries may not be supported as effectively.
 - (v) Day to day operational data can be processed rapidly.
 - (vi) Any group of records with natural relation may fit nicely.
 - (vii) Records are logically structured in inverted tree pattern.
 - (viii) It provides the parent – child relationship amongst the nodes.
 - (ix) It implements one-to-one and one-to-many relationship.
11. (a) 'Backup' is a utility program used to make a copy of the contents of database files and log files. The database files consist of a database root file, log file, mirror log file, and other database files called dbspaces.

'Recovery' is a sequence of tasks performed to restore a database to some point-in-time. Recovery is performed when either a hardware or media failure occurs. Hardware failure is a physical component failure in the machine, such as, a disk drive, controller card, or power supply. Media failure is the result of unexpected database error when processing data.

Certain issues related with Database Backup and Recovery are discussed below.

A **Transaction Log** is a file that records database modifications. Database modification consists of inserts, updates, deletes, commits, rollbacks, and database schema changes.

A **Mirror Log** is an optional file and has a file extension of .mlg. It is a copy of a transaction log and provides additional protection against the loss of data in the event the transaction log becomes unusable.

An **Online Backup** is performed by executing the command-line or from the 'Backup Database' utility. When an online backup process begins the database engine externalizes all cached data pages kept in memory to the database file(s) on disk. This process is called a checkpoint. The database engine records the activity in the transaction log file while the database is being backed up. The log file is backed up after the backup utility finishes backing up the database. The log file contains all of the transactions recorded since the last database backup. For this reason the log file from an online full backup must be 'applied' to the database during recovery.

An **Offline Backup** does not have to participate in recovery but it may be used in recovery if a prior database backup is used.

A **Live Backup** is carried out by using the BACKUP utility with the command-line option. A live backup provides a redundant copy of the transaction log for restart of the system on a secondary machine in the event the primary database server machine becomes unusable.

A **Full Backup** is the database backup utility copies the database and log.

An **Incremental Backup** uses the DBBACKUP utility to copy the transaction log file since the most recent full backup.

- (b) Core phases in developing a backup and recovery strategy are discussed below.
- (i) Create backup and recovery commands. The command should be verified with the actual results produced to ensure that desired results are produced.
 - (ii) Time estimates from executing backup and recovery commands help to get a feel for how long will these tasks take. This information helps in identifying what commands will be executed and when.
 - (iii) Document the backup commands and create procedures outlining backups which are kept in a file. Also identify the naming convention used as well as the kind of backups performed.
 - (iv) Incorporate health checks into the backup procedures to ensure that the database is not corrupt. Database health check can be performed prior to backing up a database or on a copy of the database from the backup.
 - (v) Deployment of backup and recovery consists of setting up backup procedures on the production server. Verification of the necessary hardware in place and any other supporting software required to perform these tasks must be done. Modify procedures to reflect the change in environment.

- (vi) Monitor backup procedures to avoid unexpected errors. Make sure that any changes in the process are reflected in the documentation.
12. (a) A computer network is a collection of computers and terminal devices connected together by a communication system. The set of computers may include large-scale computers, medium scale computers, mini computers and microprocessors. The set of terminal devices may include intelligent terminals, dumb terminals, workstations of various kinds and miscellaneous devices such as the commonly used telephone instruments.

Benefits of using Networks are discussed below.

- (i) Organizations can **improve communication** by connecting their computers and working on standardized systems, so that:
- Staff, suppliers and customers are able to share information and get in touch more easily.
 - More information sharing can make the business more efficient –e.g. networked access to a common database can avoid the same data being keyed multiple times, which would waste time and could result in errors.
 - As staff are better equipped to deal with queries and deliver a better standard of service as they can share information about customers.
- (ii) Organization can **reduce costs and improve efficiency** by storing information in one centralized database and streamlining working practices, so that:
- Staff can deal with more customers at the same time by accessing customer and product databases.
 - Network administration can be centralized, less IT support is required.
 - Costs are cut through sharing of peripherals such as printers, scanners, external discs, tape drives and Internet access.
- (iii) Organizations can **reduce errors** and improve consistency by having all staff work from a single source of information, so that standard versions of manuals and directories can be made available, and data can be backed up from a single point on a scheduled basis, ensuring consistency.
- (b) Various types of Computer Networks are discussed below.
- (i) **Local Area Networks (LAN):** A LAN covers a limited geographical area. A typical LAN connects as many as hundred or so microcomputers that are located in a relatively small area, such as a building or several adjacent buildings. They enable multiple users to share software, data, and devices. LANs use high-speed media usually 1 MBPS to 30 Mbps or more and are mostly owned and operated privately.

- (ii) **Metropolitan Area Networks (MAN):** A metropolitan area network (MAN) is somewhere between a LAN and a WAN. The term MAN is sometimes used to refer to networks which connect systems or local area networks within a metropolitan area (roughly 40 kms or more in length from one point to another). MANs are based on fiber optic transmission technology and provide high speed (10 Mbps or so), interconnection between sites. A MAN can support both data and voice. Cable television networks are examples of MANs that distribute television signals. A MAN just has one or two cables and does not contain switching elements.
 - (iii) **Wide Area Networks (WAN):** A WAN covers a large geographic area with various communication facilities such as long distance telephone service, satellite transmission, and under-sea cables. The WAN typically involves different types of communication hardware and software. Examples of WANs are interstate banking networks and airline reservation systems. Wide area networks typically operate at lower link speeds of about 1 Mbps.
13. (a) The geometrical arrangement of computer resources, remote devices, and communication facilities is known as network structure or network topology. A computer network is comprised of nodes and links. A node is the end point of any branch in a computer, a terminal device, workstation or an interconnecting equipment facility and a link is a communication path between two nodes.

Four basic network structures or topologies are discussed below.

- (i) **Star Network:** Star Network topology is characterized by communication channels emanating from centralized computer system. The processing nodes in a star network interconnect directly with a central system. Each terminal, small computer or large mainframe can communicate only with the central site and not with other nodes in the network. If it is desired to transmit information from one node to another, it can be done only by sending the details to the central node, which in turn sends them to the destination.

Advantages

- It is easy to add new and remove nodes.
- A node failure does not bring down the entire network.
- It is easier to diagnose network problems through a central hub.

Disadvantages

- If the central hub fails, the whole network ceases to function.
- It costs more to cable a star configuration than other topologies

- (ii) **Bus Network:** In this structure or topology, a single network cable runs in the building or campus and all nodes are linked along with this communication line

with two endpoints called the bus or backbone. Two ends of the cable are terminated with terminators.

Advantages

- It is reliable in very small networks as well as easy to use and understand.
- It requires the least amount of cable to connect the computers together and therefore is less expensive than other cabling arrangements.
- It is easy to extend the communication by joining two cables with a connector, making a longer cable for more computers to join the network.

Disadvantages

- Heavy network traffic can slow a bus considerably as any computer can transmit the data at any time. Computers interrupting each other can use a lot of bandwidth.
- Each connection between two cables weakens the electrical signal.
- The bus configuration can be difficult to trouble shoot. A cable break or malfunctioning computer can be difficult to find and can cause the whole network to stop functioning.

- (iii) **Ring Network:** In this topology, the network cable passes from one node to another until all nodes are connected in the form of a loop or ring. There is a direct point-to-point link between two neighboring nodes. These links are unidirectional which ensures that transmission by a node traverses the whole ring and comes back to the node, which made the transmission. Ring Network topology is particularly appropriate for organizations that require a centralized database or a centralized processing facility.

Advantages

- Ring networks offer high performance for a small number of workstations.
- These can span longer distances compared to other types of networks.
- Ring networks are easily extendable.

Disadvantages

- It is relatively expensive and difficult to install.
- Failure of one computer on the network can affect the whole network.
- It is difficult to trouble shoot a ring network. Adding or removing computers can disrupt the network.

- (iv) **Mesh Network:** In this structure, there is random connection of nodes using communication links. A mesh network may be fully connected or connected

with only partial links. In fully interconnected topology, each node is connected by a dedicated point to point link to every node. In partially connected mesh topology, computer nodes are widely scattered.

Advantages

- Yields the greatest amount of redundancy in the event that one of the nodes fails where network traffic can be redirected to another node.
- Network problems are easier to diagnose.

Disadvantages

- The cost of installation and maintenance is high.
- Setting up connections and agreements between dispersed computers is complicated.

14. (a) Client/Server (C/S) refers to computing technologies in which the hardware and software components (i.e., clients and servers) are distributed across a network. The client/server software architecture is a versatile, message-based and modular infrastructure that is intended to improve usability, flexibility, interoperability, and scalability as compared to centralized, mainframe, time sharing computing. This technology includes both the traditional database-oriented client server technology, as well as more recent general distributed computing technologies.

Characteristics of Client/Server technology are as follows.

- (i) It consists of a client process and a server process that can be distinguished from each other.
- (ii) The client portion and the server portion can operate on separate computer platforms.
- (iii) Either the client or the server platform can be upgraded without having to upgrade the other platform.
- (iv) The server is able to service multiple clients concurrently.
- (v) The system includes some sort of networking capability.
- (vi) A significant portion of the application logic resides at the client end.
- (vii) Action is usually initiated at the client end and not the server end.
- (viii) A user-friendly graphical user interface (GUI) generally resides at the client end.
- (ix) A structured query language (SQL) capability is available to client server system.
- (x) Database server provides data protection and security.

(b) Components of client server architecture are as follows.

- (i) **Client:** Clients, which are typically PCs, are the “users” of the services offered by the servers. There are basically three types of clients.

Non-Graphical User Interface (GUI) clients require a minimum amount of human interaction. It includes ATMs, cell phones, fax machines, and robots.

GUI clients are human interaction models usually involving object/action models like the pull-down menus in Windows 3-X.

Object-Oriented User Interface (OOUI) clients take GUI-clients even further with expanded visual formats, multiple workplaces, and object interaction rather than application interaction. Windows 95 is a common OOUI client.

- (ii) **Server:** Servers await requests from the client and regulate access to shared resources. File servers make it possible to share files across a network by maintaining a shared library of documents, data, and images. Database servers, transaction servers and web servers are some of the servers used in client server architecture.
- (iii) **Middleware:** The network system implemented within the client/server technology is termed as Middleware. It is all the distributed software needed to allow clients and servers to interact. General middleware allows for communication, directory services, queuing, distributed file sharing, and printing.
- (iv) **Fat-client or Fat-server:** Fat-client allows more of the processing to take place on the client, like with a file server or database server. Fat-servers place more emphasis on the server and try to minimize the processing done by clients. Transactions, GroupWare, and Web servers are examples of Fat Servers. Fat Clients are also referred to as “2-Tier” systems and Fat-servers as “3-Tier” systems.
- (v) **Network:** The network hardware is the cabling, the communication cords, and the device that link the server and the clients. The communication and data flow over the network is managed and maintained by network software.

15. (a) Implementation of Network Security programs involve following eight steps.

- (i) **Preparing project plan for enforcing security:** The project plan components are at first outlining the objectives of the review followed by in sequence determining the scope of the review and tasks to be accomplished, assigning tasks to the project team after organizing it, preparing resources budget which will be determined by the volume and complexity of the review and fixing a target / schedule for task completion.
- (ii) **Assets identification :** Assets which need to be safeguarded can be identified and subdivided into Personnel, Hardware, Facilities, Documentation, Supplies,

Data, Application Software and System Software.

- (iii) **Assets valuation** : The process of valuation can differ depending on who is asked to render the valuation, the way in which the asset can be lost and the period for which it is lost and how old is the asset. Valuation of physical assets cannot be considered apart from the valuation of the logical assets. For example, the replacement value of the contents in a micro computer's hard disk may be several times more than the replacement value of the disk itself.
- (iv) **Threats identification**: The source of a threat can be external or internal and the nature of a threat can be accidental / non-deliberate or deliberate needs to be identified. The example of a non-deliberate external threat is an act of God, non-deliberate internal threat is pollution, deliberate external threat is hackers, and deliberate internal threat is employees. More exhaustively, the sources of threat are the Nature or acts of God.
- (v) **Threats probability of occurrence assessment**: The fifth step in a security review is assessment or the probability of occurrence of threats over a given time period. It is not difficult if prior period statistical data is available. If however, prior period data is not available, it has to be elicited from the associated stakeholders like end users and the management.
- (vi) **Exposure analysis** :The sixth step involves firstly identifying the controls in the place, secondly assessing the reliability of the existing controls, thirdly evaluating the probability that a threat can be successful and lastly assessing the resulting loss if the threat is successful. For each asset and each threat the expected loss can be estimated as the product of the probability of threat occurrence, probability of control failure and the resulting loss if the threat is successful.
- (vii) **Controls adjustment**: The seventh step is the adjustment of controls which means whether over some time period any control can be designed, implemented and operated such that the cost of control is lower than the reduction in the expected losses. The reduction in the expected losses is the difference between expected losses with the (i) existing set of controls and (ii) improved set of controls.
- (viii) **Report generation documentation for individual systems, end user, etc.:** The last step is report generation documenting, the findings of the review and specially recommending new assets safeguarding techniques that should be implemented and existing assets safeguarding mechanisms that should be eliminated / rectified, and also recommending the assignment of the levels of security to be pervaded for individual end users and systems.

- (b) The threats to the security of system assets can be broadly divided into nine categories. They are as follows.
- (i) Fire,
 - (ii) Water,
 - (i) Energy variations like voltage fluctuation, circuit breakage, etc,
 - (iv) Pollution,
 - (v) Intrusions and eavesdropping, which can be eliminated / minimised by physical access controls, prevention of electromagnetic emission and providing the facilities with their proper locations / sites,
 - (vi) Viruses and worms, which can be avoided by using licensed copies of software files, cutting the use of shareware, downloading files or software only from reliable websites, implementing read-only access to software, installing anti-virus software,
 - (vii) Misuse of software, data and services, which can be avoided by preparing employees' code of conduct,
 - (viii) Structural damages and
 - (ix) Hackers, the expected loss from whose activities can be mitigated only by robust logical access controls.
16. (a) The common applications of the Internet can be classified into three primary types namely: Communication, Data retrieval and Data publishing.
- (i) **Communication:** Communication on the Internet can be online or offline. Users can connect to a single server or an on-line service and at the same time, they can communicate in an "online chat". This can be truly "many to many" communication as in a room full of people talking to each other on peer to peer basis. Alternatively, the users send e-mail to each other which can be read by the receiver whenever he/she finds the time. This is off-line communication, but is "one to one" or "one to many". Similarly, it is possible for users to get together electronically with those sharing common interests in "usenet" groups. The users post messages to be read and answered by others at their convenience, in turn all of which can be read and replied to by others and so on.
 - (ii) **Data Retrieval:** For meaningful data retrieval, availability of data that has been compiled from various sources and put together in a usable form is an essential prerequisite. On the Internet, a large number of databases exist. These have been put together by commercially run data providers as well as individuals or groups with special interest in particular areas. To retrieve such data, any user needs to know the address(s) of such Internet servers.

- (iii) **Data Publishing:** Data publishing is a new opportunity that Internet has made possible. Information that needs to be made available to others can either be forwarded to specific addresses, posted in a Usenet site or kept on display in a special site. Internet discourages by social pressure and sending of unsolicited E-mail.
- (b) The Intranet is a type of information system that facilitates communication within the organization, among widely dispersed departments, divisions and regional locations. Intranets connect people together with Internet technology using the Web Browsers, Web Servers and Data warehouses in a single view. With an Intranet, access to all information, applications and data can be made available through the same browser. The objective is to organize each individual's desktop with minimal cost, time and effort to be more productive, cost-efficient, timely and competitive.

Key benefits of using Intranet are as follows.

- (i) **Workforce Productivity:** Intranets can help users to locate and view information faster and use applications relevant to their roles and responsibilities. With the help of a web browser interface, users can access data held in any database the organization wants to make available, anytime and subject to security provisions from anywhere within the company workstations, increasing employees' ability to perform their jobs faster, more accurately, and with confidence that they have the right information. It also helps to improve the services provided to the users.
- (ii) **Time :** With Intranets, organizations can make more information available to employees on a "pull" basis (i.e., employees can link to relevant information at a time which suits them) rather than being deluged indiscriminately by emails.
- (iii) **Communication:** Intranets can serve as powerful tools for communication within an organization, vertically and horizontally. From communication standpoint, Intranets are useful to communicate strategic initiatives that have a global reach throughout the organization. The type of information that can easily be conveyed is the purpose of the initiative and what the initiative is aiming to achieve, who is driving the initiative, results achieved to date, and whom to speak to for more information.
- (iv) **Web publishing:** It allows 'cumbersome' corporate knowledge to be maintained and easily accessed throughout the company using hypermedia and web technologies.
- (v) **Business Operations and Management:** Intranets are also being used as a platform for developing and deploying applications to support business operations and decisions across the internetworked enterprise.
- (vi) **Cost-effective :** Users can view information and data via web browser rather than maintaining physical documents such as procedure manuals, internal

phone list and requisition forms.

- (vii) **Promote Common Corporate Culture:** Every user is viewing the same information within the Intranet.
- (viii) **Enhance Collaboration:** With information easily accessible by all authorised users, teamwork is enabled.
- (ix) **Cross-platform Capability:** Standards compliant web browsers are available for Windows, MAC, and UNIX.
- (x) **Planning and Creating an Intranet:** Most organizations devote considerable resources into the planning and implementation of their Intranet as it is of strategic importance to the organization's success.

17. (a) **Supply Chain Management (SCM):** It is the process of planning, implementing and controlling the operations of the supply chain with the purpose to satisfy customer requirements as efficiently and effectively as possible. It spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.

A SCM must address the following problems:

- (i) **Distribution Network Configuration:** Number and location of suppliers, production facilities, distribution centres, warehouse and customers.
 - (ii) **Distribution Strategy:** Centralised versus decentralized, direct shipment, cross docking, pull or push strategies, third party logistics.
 - (iii) **Information:** Integrate systems and processes through the supply chain to share valuable information including demand signals, forecasts, inventory and transportation.
 - (iv) **Inventory Management:** Quantity and location of inventory including raw materials, work-in-process and finished goods.
- (b) The strategic and competitive areas which can be used to their full advantage if a SCM system is properly implemented are as follows.
- (i) **Fulfillment:** Ensuring the right quantity of parts for production or products for sale arrive at the right time enabled through efficient communication, ensuring that orders are placed with the appropriate amount of time available to be filled.
 - (ii) **Logistics:** Keeping the cost of transporting materials as low as possible consistent with safe and reliable delivery. Thus, SCM enables a company to have constant contact with its distribution team and allow the company to track the location of material all the time.
 - (iii) **Production:** Production can run smoothly as a result of fulfillment and logistics being implemented correctly. If the correct quantity is not ordered and

delivered at the requested time, production will be halted, but having an effective supply chain management system in place will ensure that production can always run smoothly without delays due to ordering and transportation.

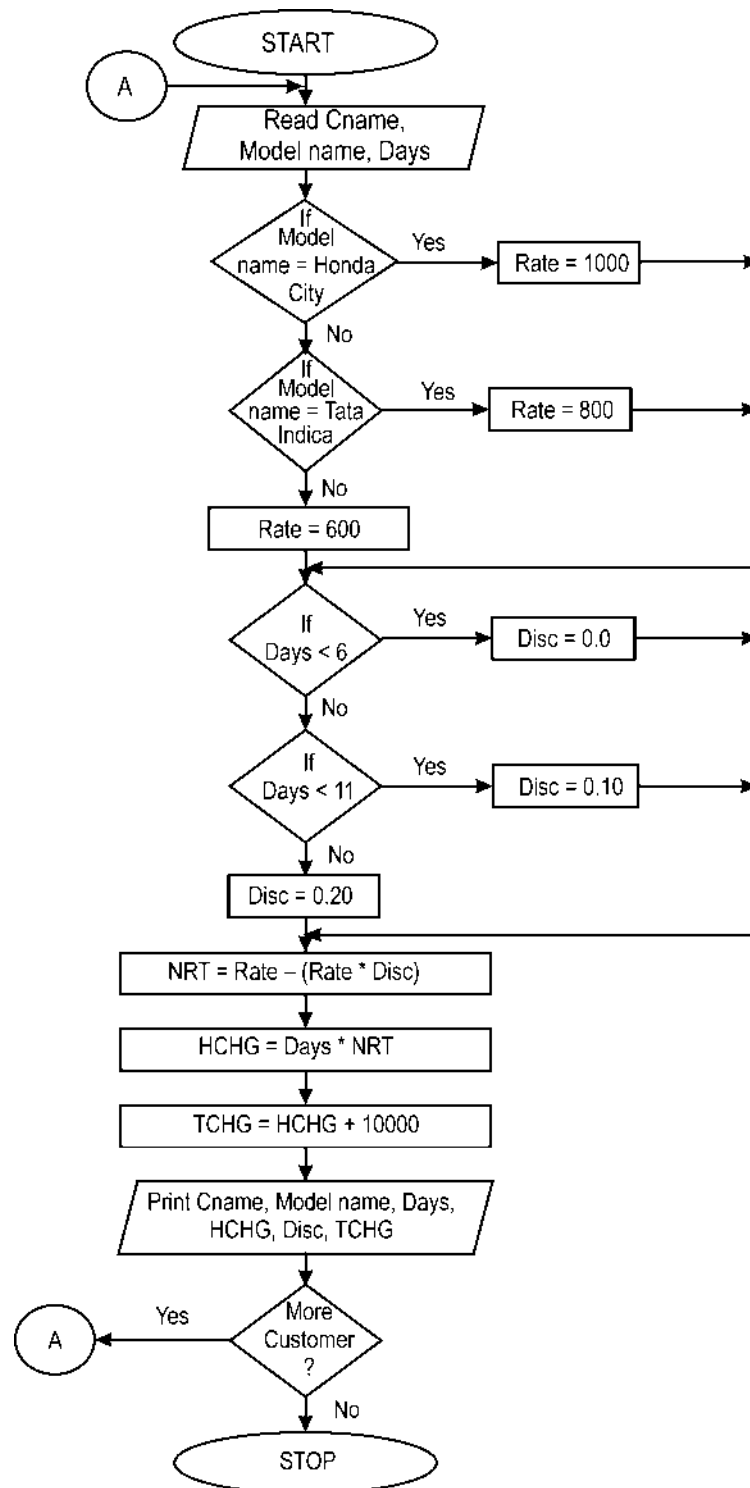
- (iv) **Revenue & Profit:** Managing the supply chain improves a company's flexibility to respond to unforeseen changes in demand and supply. Because of this, a company has the ability to produce goods at lower prices and distribute them to consumers quicker than companies without supply chain management thus increasing the overall profit.
 - (v) **Costs:** Keeping the cost of purchased parts and products at acceptable levels. SCM reduces costs by increasing inventory turnover on the shop floor thus reducing internal and external failure costs and working with suppliers to produce the most cost efficient means of manufacturing a product.
 - (vi) **Cooperation:** Collaborative planning, forecasting and replenishment (CPFR) is a longer-term commitment, joint work on quality, and support by the buyer of the supplier's managerial, technological, and capacity development. This relationship allows the company to have access to current, reliable information obtain lower inventory levels, cut lead times, enhance product quality, improve forecasting accuracy and ultimately improve customer service and overall profits.
18. (a) The step by step processing of an online transaction in e-commerce environment are as follows.
- (i) **Order Placed:** Customer places order through secure connection on website, or merchant manually keys in transaction.
 - (ii) **Authorization Request:** Payment Gateway receives the transaction through the secure Internet connection, encrypts it, and submits an authorization to the credit card issuing bank.
 - (iii) **Authorization Response:** Credit card issuing bank either approves or declines the request and sends a response back through the payment gateway to the website.
 - (iv) **Order Fulfilled:** Once approved, the merchant processes and ships the customer's order.
 - (v) **Settlement Request:** The Payment Gateway sends a settlement request to the merchant account provider each day that transactions are processed.
 - (vi) **Settlement Deposited:** The merchant account provider deposits the amount for each settlement into the merchant's bank account. It usually takes 24 - 48 hours.

- (b) The following tools are available to protect information and systems against compromise, intrusion or misuse.
- (i) **Firewall:** They are systems to control the flow of traffic between the Internet and the firm's internal LANs and systems. They are usually packaged as turnkey hardware/software packages, and are set up to enforce the specific security policies that are desired. A firewall is a proven, effective means of protecting the firm's internal resources from unwanted intrusion.
 - (ii) **Encryption:** It allows information to transit over the Internet while being protected from interception by eavesdroppers. There are two basic approaches to encryption:
 - **Hardware encryption:** The devices are available at a reasonable cost, and can support high- speed traffic. It also ensures that all traffic between these offices is secure.
 - **Software encryption:** It is typically employed in conjunction with specific applications. Certain electronic mail packages, for example, provide encryption and decryption for message security.
 - (iii) **Message Authentication:** It makes sure that a message is really from whom it purports to be and that it has not been tampered with.
 - (iv) **Site Blocking:** It is a software-based approach that prohibits access to certain websites that are deemed inappropriate by management. For example, sites that contain explicit objectionable material can be blocked to prevent employee's from accessing these sites from company's Internet server. In addition to blocking sits, companies can also log activities and determine the amount of time spent on the Internet and identify the sits visited.

19. The required flowchart is discussed on next page.

Abbreviation:

Cname	-	Customer Name
NRT	-	Net Rate
HCHG	-	Hire Charges
TCHG	-	Total Charges
DISC	-	Discount



20. (a) A decision table is a precise yet compact way to model complicated logic which defines the possible contingencies that may be considered within the program and the appropriate course of action for each contingency.

The components of the decision table are as follows.

- (i) **Condition Statement** - Statement which introduce one or more conditions i.e., factors to consider in making a decision.
 - (ii) **Condition Entries** - Entries that complete condition statements.
 - (iii) **Action Statements** - Statements which introduce one or more actions i.e., steps to be taken when a certain combination of conditions exist.
 - (iv) **Action Entries** - Entries that complete the action statements.
 - (v) **Rules** - Unique combinations of conditions and actions to be taken under those conditions.
 - (vi) **Header** - Title identifying the table.
 - (vii) **Rule Identifiers** - Code (R1, R2, R3,) uniquely identifying each rule within a table.
 - (viii) **Condition Identifiers** - Codes (C1, C2, C3,...) uniquely identifying each condition statements/entry.
 - (ix) **Action Identifiers** - Codes (A1, A2, & A3...) uniquely identifying each action statement/entry.
- (b) Advantages of using a Decision Table are as follows.
- (i) A decision table provides a framework for a complete and accurate statement of processing or decision logic. It forces a discipline on the programmer to think through all possible conditions.
 - (ii) A decision table may be easier to construct than a flow chart.
 - (iii) A decision table is compact and easily understood making it very effective for communication between analysts or programmers and non-technical users.
 - (iv) Direct conversion of decision table into a computer program is possible. Software packages are available which take the statement specifying a decision table and compile it into a program.
 - (v) It is possible to check that all test combinations have been considered.
 - (vi) Alternatives are shown side by side to facilitate analysis of combinations.
 - (vii) The table shows cause and effect relationships.

- (viii) They use standardized format.
- (ix) Typists can copy tables with virtually no question or problems.
- (x) Complex tables can easily be split into simpler tables.
- (ix) Decision Table users are not required to possess computer knowledge.

Disadvantages of using a Decision Table are as follows.

- (i) **Total sequence:** The total sequence is not clearly shown i.e., no overall picture is given by decision tables as presented by flow charts.
- (ii) **Logic:** Where the logic of a system is simple, flowcharts nearly always serve the purpose better than a decision table.

SECTION – B: STRATEGIC MANAGEMENT

QUESTIONS

Correct/Incorrect with reasoning

- (1) State with reasons which of the following statements are correct/incorrect:
- (a) Substitute products are latent source of competition.
 - (b) Stability is not an objective of an organization.
 - (c) Corporate-level managers can be viewed as the guardians of shareholders.
 - (d) Strategic management help organizations to be more reactive in shaping their future.
 - (e) Key success factors are constant for all industries.
 - (f) In BCG matrix, "Question Marks" represent low growth and high market share businesses or products.
 - (g) The balance scorecard approach requires more emphasis on financial objectives than on strategic objectives.
 - (h) Publicity is a personal form of promotion.
 - (i) A SBU is a group of unrelated businesses.

Fill in the blanks

- (2) Fill in the blanks in the following statements with the most appropriate word:
- (a) _____ consist of external factors related to human relationships and the impact of social attitudes and cultural values which has bearing on the business of the organization.
 - (b) _____ are organizations performance targets – the results and outcomes it wants to achieve.
 - (c) In GE portfolio matrix, the vertical axis represents _____ and horizontal axis represents _____.
 - (d) Supply chain management is conceptually wider than _____ management.
 - (e) The role of human resource manager is _____ in building up core competence of the firm.
 - (f) TQM is a people-focused management system that aims at continual increase in _____ satisfaction at continually lower real cost.
 - (g) Benchmarking is a process of continuous improvement in search for _____ advantage.

- (h) _____ leadership style use charisma and enthusiasm to inspire people to exert them for the good of the organization.
- (i) In Kurt Lewin change process _____ occurs when the new behaviour becomes a normal way of life.
- (j) Divestment is usually a part of _____ or restructuring plan.

Explain the concepts

3. Explain the meaning of the following concepts:

- (a) Environmental scanning
- (b) Corporate strategy
- (c) Strategic decision making
- (d) Mission statement
- (e) Market penetration
- (f) Portfolio analysis
- (g) Competitive strategy
- (h) Strategic business units
- (i) Competitive advantage
- (j) Globalization

Differences between the two concepts

4. Distinguish between the following:

- (a) Strategy formulation and strategy implementation.
- (b) Forward and backward integration.
- (c) Vision statement and mission statement
- (d) Transformational and transactional leadership
- (e) SWOT and TOWS Matrix

Short notes

5. Write short notes on the following:

- (a) Objectives of business
- (b) Importance of strategic management
- (c) Key success factors
- (d) Expansion through acquisitions and mergers
- (e) Evaluating the worth of a business

- (f) Network structure
- (g) Central thrust of BPR

Brief answers

6. Briefly answer the following questions:
- (a) What is strategic vision?
 - (b) Define 'five forces model.'
 - (c) What do you understand by ethnic mix?
 - (d) Explain the term star in the context of BCG matrix.
 - (e) Grand strategy alternative during recession.
 - (f) Logistics strategy.
 - (g) How internet has helped business?

Chapter 1-Business Environment

7. What is Environment? Briefly explain macro environmental factors that affect an organization's strategy.
8. Do you think that competition is always bad for organisations? Explain Porter's five forces model as to how businesses can deal with the competition.

Chapter 2-Business Policy and Strategic Management

9. What do you understand by strategic management? Discuss its framework.
10. What do you understand by 'Strategy'? Explain the four generic strategies as discussed by Glueck and Jauch.

Chapter 3-Strategic Analysis

11. Describe in detail the SWOT analysis. What is its significance in organizations?
12. Describe the construction of BCG matrix and discuss its utility in strategic management.

Chapter 4-Strategic Planning

13. Under what conditions would you recommend the use of turnaround strategy in an organization? What could be a suitable work plan for this?
14. Discuss strategic alternatives with reference to Michael Porter's strategies.

Chapter 5-Formulation of Functional Strategy

15. What do you understand by the term marketing mix? Discuss its various constituents.
16. What is supply chain management? Is it same as logistics management? Discuss.

Chapter 6-Strategic Implementation and Control

17. Explain briefly strategic control. Also elaborate the various types of strategic control.
18. Define corporate culture. Also elucidate the statement “Culture is a strength that can also be a weakness”.

Chapter 7-Reaching Strategic Edge

19. What are the various guiding principles of total quality management?
20. Define Business Process Re-engineering. Briefly outline the steps therein.

SUGGESTED ANSWERS/HINTS

1. (a) **Correct:** Substitute products are a latent source of competition in an industry. In many cases, they become a major constituent of competition. Substitute products offering a price advantage and/or performance improvement to the consumer can drastically alter the competitive character of an industry. For example, coir suffered at the hands of synthetic fibre. Wherever, substantial investment in R&D is taking place, threats from substitute products can be expected. Substitutes, too, usually limit the prices and profits in an industry.
- (b) **Incorrect:** One of the most important of objectives of business enterprises is stability. It is a cautious, conservative objective. In a sense, stability is an inexpensive and least risk objective in terms of managerial time and talent and other resources. A stable and steady enterprise minimises managerial tensions and demands less dynamism from managers. It is a strategy of least resistance to the hostile external environment.
- (c) **Correct:** Corporate-level managers provide a link between the people who oversee the strategic development of a firm and those who own it (the shareholders). Corporate-level managers, and particularly the CEO, can be viewed as the guardians of shareholder welfare. It is their responsibility to ensure that the corporate and business strategies that the company pursues are consistent with maximizing shareholder wealth. If they are not, then ultimately the CEO is likely to be called to account by the shareholders.
- (d) **Incorrect:** Strategic management helps organisations to be more proactive instead of reactive in shaping its future. Organisations are able to analyse and take actions instead of being mere spectators. Thereby they are able to control their own destiny in a better manner. It helps them in working within vagaries of environment and shaping it, instead of getting carried away by its turbulence or uncertainties.
- (e) **Incorrect:** Key success factors vary from industry to industry and even from time to time within the same industry as driving forces and competitive conditions change.

Rarely an industry has more than three or four key success factors at any one time. And even among these three or four, one or two usually outrank the others in importance. Managers, therefore, have to resist the temptation to include factors that have only minor importance. To compile a list of every factor that matters even a little bit defeats the purpose of concentrating management attention on the factors truly critical to long-term competitive success.

- (f) Incorrect: Question Marks, sometimes called problem children or wildcats, are low market share business in high-growth markets. They require a lot of cash to hold their share. They need heavy investments with low potential to generate cash. Question marks if left unattended are capable of becoming cash traps. Since growth rate is high, increasing it should be relatively easier. It is for business organisations to turn them stars and then to cash cows when the growth rate reduces.
 - (g) Incorrect: The balanced scorecard approach for measuring company performance requires setting both financial and strategic objectives and tracking their achievement. Unless a company is in deep financial difficulty, such that its very survival is threatened, company managers are well advised to put more emphasis on achieving strategic objectives than on achieving financial objectives whenever a trade-off has to be made. The surest path to sustained future profitability quarter after quarter and year after year is to relentlessly pursue strategic outcomes that strengthen a company's business position and, ideally, give it a growing competitive advantage over rivals.
 - (h) Incorrect: Publicity is also a non-personal form of promotion similar to advertising. However, no payments are made to the media as in case of advertising. Organizations skillfully seek to promote themselves and their product without payment. Publicity is communication of a product, brand or business by placing information about it in the media without paying for the time or media space directly. Basic tools for publicity are press releases, press conferences, reports, stories, and internet releases. These releases must be of interest to the public.
 - (i) Incorrect: An SBU is a grouping of related businesses, which is amenable to composite planning treatment. As per this concept, a multi-business enterprise groups its multitude of businesses into a few distinct business units in a scientific way. The purpose is to provide effective strategic planning treatment to each one of its products/businesses.
2. (a) Socio-cultural environment
(b) Objectives
(c) Market attractiveness and Business position.
(d) Logistics
(e) Significant

- (f) Customer
 - (g) Competitive
 - (h) Transformational
 - (i) Refreezing
 - (j) Rehabilitation
3. (a) Environmental scanning also known as environmental monitoring is the process of gathering information regarding company's environment, analysing it and forecasting the impact of all predictable environmental changes. Successful marketing depends largely on how a company can synchronise its marketing programmes with its environmental changes.
- (b) Corporate strategy is basically the growth design of the firm; it spells out the growth objective - the direction, extent, pace and timing of the firm's growth. It also spells out the strategy for achieving the growth. Thus, we can also describe corporate strategy as the objective-strategy design of the firm.
- (c) Decision making is a managerial process and function of choosing a particular course of action out of several alternative courses for the purpose of accomplishment of the organizational goals. Decisions are routine, tactical or strategic in nature. Strategic decisions are different from other decisions. They have long term implications, steer organisation to its future path, have organisation wide implications and so on. These decisions are taken considering different internal and external factors. They are also taken with partial or no definite knowledge of different factors affecting the decision situation.
- (d) A company's Mission statement is typically focused on its present business scope – "who we are and what we do". Mission statements broadly describe an organizations present capabilities, customer focus, activities, and business makeup.
- (e) Market penetration refers to a growth strategy where the business focuses on selling existing products into existing markets. It is achieved by making more sales to present customers without changing products in any major way. Prices are kept below competition to obtain a large share of market and to develop popularity. Penetration might require greater spending on advertising or personal selling.
- (f) Portfolio analysis can be defined as a set of techniques that help strategists in taking strategic decisions with regard to individual products or businesses in a firm's portfolio. It is primarily used for competitive analysis and corporate strategic planning in multi product and multi business firms.
- (g) Competitive strategy provides the framework that guides competitive positioning decisions. It examines the way in which an organization can compare more effectively to strengthen its market position and build a sustainable competitive advantage.

- (h) Strategic Business Units are units within the overall organization for which there is an external market for goods or services distinct from other strategic business units.
 - (i) Competitive advantage is the result of a strategy capable of helping a firm to maintain and sustain a favourable market position. This position is translated into higher profits compared to those obtained by competitors operating in the same industry.
 - (j) Globalization refers to the process of integration of the world into one huge market. Such unification calls for removal of all trade barriers among countries. Globalization is an opportunity for organizations to expand their markets and reach out to different customers.
4. (a) Distinction between strategy formulation and strategy implementation: Although inextricably linked, strategy implementation is fundamentally different from strategy formulation in the following ways:
- (i) Strategy formulation is positioning forces before the action. Strategy implementation is managing forces during the action.
 - (ii) Strategy formulation focuses on effectiveness whereas strategy implementation focuses on efficiency.
 - (iii) Strategy formulation is primarily an intellectual process whereas implementation of strategy is primarily an operational process.
 - (iv) Strategy formulation requires good intuitive and analytical skills while strategy implementation requires special motivation and leadership skills.
 - (v) Strategy formulation requires coordination among a few individuals while strategy implementation requires organization wide coordination.
- (b) Forward and backward integration forms part of vertically integrated diversification. In vertically integrated diversification, firms opt to engage in businesses that are vertically related to the existing business of the firm. The firm remains vertically within the same process. While diversifying firms opt to engage in businesses that are linked forward or backward in the chain and enter specific product/process steps with the intention of making them into new businesses for the firm.
- Backward integration is a step towards, creation of effective supply by entering business of input providers. Strategy employed to expand profits and gain greater control over production of a product whereby a company will purchase or build a business that will increase its own supply capability or lessen its cost of production. While forward integration is moving forward in the value chain and entering business lines that use existing products.
- (c) A *Mission statement* tells you the fundamental purpose of the organization. It concentrates on the present. It defines the customer and the critical processes. It informs you of the desired level of performance. On the other hand, a *Vision*

statement outlines what the organization wants to be. It concentrates on the future. It is a source of inspiration. It provides clear decision-making criteria.

A mission statement can resemble a vision statement in a few companies, but that can be a grave mistake. It can confuse people. Following are the differences between vision and mission:

- “ The vision describes a future identity while the Mission serves as an ongoing and time-independent guide.
 - “ The vision statement can galvanize the people to achieve defined objectives, even if they are stretch objectives, provided the vision is specific, measurable, achievable, relevant and time bound. A mission statement provides a path to realize the vision in line with its values. These statements have a direct bearing on the bottom line and success of the organization.
 - “ A mission statement defines the purpose or broader goal for being in existence or in the business and can remain the same for decades if crafted well while a vision statement is more specific in terms of both the future state and the time frame. Vision describes what will be achieved if the organization is successful.
- (d) **Transformational leadership style** use charisma and enthusiasm to inspire people to exert them for the good of the organization. Transformational leadership style may be appropriate in turbulent environments, in industries at the very start or end of their life-cycles, in poorly performing organizations when there is a need to inspire a company to embrace major changes. Transformational leaders offer excitement, vision, intellectual stimulation and personal satisfaction. They inspire involvement in a mission, giving followers a ‘dream’ or ‘vision’ of a higher calling so as to elicit more dramatic changes in organizational performance. Such a leadership motivates followers to do more than originally affected to do by stretching their abilities and increasing their self-confidence, and also promote innovation throughout the organization.

Whereas, **transactional leadership style** focus more on designing systems and controlling the organization's activities and are more likely to be associated with improving the current situation. Transactional leaders try to build on the existing culture and enhance current practices. Transactional leadership style uses the authority of its office to exchange rewards, such as pay and status. They prefer a more formalized approach to motivation, setting clear goals with explicit rewards or penalties for achievement or non-achievement.

Transactional leadership style may be appropriate in settled environment, in growing or mature industries, and in organizations that are performing well. The style is better suited in persuading people to work efficiently and run operations smoothly.

- (e) TOWS Analysis is a variant of the classic business tool, SWOT Analysis. TOWS and SWOT are acronyms for different arrangements of the words Strengths, Weaknesses, Opportunities and Threats. By analyzing the external environment (threats and opportunities), and internal environment (weaknesses and strengths), we can use these techniques to think about the strategy of a company. Following are the some basic differences between TOWS and SWOT matrix:
- .. TOWS emphasises on external environment whereas SWOT emphasises on internal environment.
 - .. TOWS matrix is about the combinations of SO, ST, WO, WT whereas SWOT matrix is about S, W, O, T.
 - .. TOWS analysis is an action tool whereas SWOT analysis is a planning tool.
 - .. TOWS is particularly useful in evaluating the potential impact of sudden events or developments while SWOT is usually employed in evaluating a company's business plan.
5. (a) Enterprises pursue multiple objectives rather than a single objective. In general, we may identify a set of business objectives pursued by a large cross-section of enterprises. These relate to profitability, productive efficiency, growth, technological dynamism, stability, self-reliance, survival, competitive strength, customer service, financial solvency, product quality, diversification, employee satisfaction and welfare, and so on. Enterprises seek to balance these objectives in some appropriate manner. We may now elaborate some of the more important objectives of business
- .. Survival
 - .. Stability
 - .. Growth
 - .. Efficiency
 - .. Profitability
- (b) The major benefits of strategic management are:
- .. Strategic management helps organisations to be more proactive instead of reactive in shaping its future.
 - .. Strategic management provides framework for all the major business decisions of an enterprise.
 - .. Strategic management is concerned with ensuring a good future for the firm.
 - .. Strategic management serves as a corporate defence mechanism against mistakes and pitfalls.

“ Over a period of time strategic management helps organisation to evolve certain core competencies and competitive advantages that assist in its fight for survival and growth.

- (c) An industry's Key Success Factors (KSFs) are those things that most affect industry members' ability to prosper in the marketplace - the particular strategy elements, product attributes, resources, competencies, competitive capabilities, and business outcomes that spell the difference between profit and loss and, ultimately, between competitive success or failure.
- (d) Acquisition or merger with an existing concern is an instant means of achieving the expansion. It is an attractive and tempting proposition in the sense that it circumvents the time, risks and skills involved in screening internal growth opportunities, seizing them and building up the necessary resource base required to materialise growth. Organizations consider merger and acquisition proposals in a systematic manner, so that the marriage will be mutually beneficial, a happy and lasting affair.

Apart from the urge to grow, acquisitions and mergers are resorted to for purposes of achieving a measure of synergy between the parent and the acquired enterprises. Synergy may result from such bases as physical facilities, technical and managerial skills, distribution channels, general administration, research and development and so on.

- (e) Evaluating the worth of a business is central to strategy implementation because integrative, intensive, and diversification strategies are often implemented by acquiring other firms. Other strategies, such as retrenchment may result in the sale of a division of an organization or of the firm itself.

All the various methods for determining a business's worth can be grouped into three main approaches:

The first approach, in evaluating the worth of a business is determining its net worth or stockholders' equity.

The second approach, to measuring the value of a firm grows out of the belief that the worth of any business should be based largely on the future benefits its owners may derive through net profits.

The third approach, letting the market determine a business's worth, involves three methods.

- (f) Network structure is a newer and somewhat more radical organizational design. The network structure could be termed as 'non-structure' as it virtually eliminates in-house business functions and outsources many of them. A corporation organized in this manner is a virtual organization because it is composed of a series of project groups or collaborations linked by constantly changing non-hierarchical, cobweb-like

networks. The network structure becomes most useful when the environment of a firm is unstable and is expected to remain so.

- (g) BPR is continuous improvement process. Although BPR is a multi-dimensional approach in improving the business performance its thrust area may be identified as "the reduction of the total cycle time of a business process." BPR aims at reducing the cycle time of process by eliminating the unwanted and redundant steps and by simplifying the systems and procedures and also by eliminating the transit and waiting times as far as possible. Even after redesigning of a process, BPR maintains a continuous effort for more and more improvement.
6. (a) A strategic vision delineates organisation's aspirations for the business, providing a panoramic view of the position where the organisation is going. A strategic vision points an organization in a particular direction, charts a strategic path for it to follow in preparing for the future, and moulds organizational identity. A Strategic vision is a road map of a company's future – providing specifics about technology and customer focus, the geographic and product markets to be pursued, the capabilities it plans to develop, and the kind of company that management is trying to create.
- (b) 'Five Force Model' is a tool for strategic action and involves the analysis of customers, suppliers, potential entrants and substitute products, all of whom have the potential to impact the market depending on the industry. It is a powerful and widely used tool for systematically diagnosing the significant competitive pressures in the market and assessing their strength and important. These five forces are:
- .. Threat of new entrants.
 - .. Bargaining power of customers.
 - .. Bargaining power of suppliers.
 - .. Rivalry among current players.
 - .. Threat from substitutes.
- (c) Ethnic mix reflects the changes in the ethnic make-up of a population and has implications both for a company's potential customers and for the workforce. Issues that should be addressed include:
- .. What do changes in the ethnic mix of the population imply for product and service design and delivery?
 - .. Will new products and services be demanded or can existing ones be modified?
 - .. Managers prepared to manage a more culturally diverse workforce?
 - .. How can the company position itself to take advantage of increased workforce heterogeneity?

- (d) Star in BCG Matrix: BCG growth-share matrix is a simple way to portray an organisation's portfolio of investments. Growth share matrix also known for its cow and dog metaphors is popularly used for resource allocation in a diversified company. The matrix is based on combinations of relative market share of the products or SBUs and their market growth rate.

Stars, a position in the matrix, are characterised by high market share and high growth rate. They are products or SBUs that are growing rapidly. They also need heavy investment to maintain their position and finance their rapid growth potential. Business organisations that enjoy star positions have best opportunities for expansion and growth.

- (e) Stability strategy is advisable option for the organisations facing recession. During recession businesses face reduced demand for their products even at low prices. Funds become scarce, expenditure on expansion is stopped, profits decline and businesses try to minimise the costs. They work hard to maintain the existing market share, so that company survives the recessionary period.
- (f) Management of logistics is a process which integrates the flow of materials into, through and out of an organization to achieve a level of service that the right materials are available at the right place at the right time, of right quality and at the right cost. For a business organization effective logistics strategy will involve raising and finding solutions to the questions relating to raw material, manufacturing locations, products, transportation and deployment of inventory. Improvement in logistics can result in saving in cost of doing business.

When a company creates a logistics strategy it is defining the service levels at which its logistics systems are highly effective. A company may develop a number of logistics strategies for specific product lines, specific countries or specific customers to address different categorical requirements.

- (g) The Internet is an integrated network of high-speed computers and servers, digital switches and routers, telecommunications equipment and lines and individual computers of users. The Internet has provided a very fast means of communication to business with no geographic limitations. Internet also makes it feasible for companies to find, negotiate and deal across the world with suppliers on one hand and customers on the other. The evolving Internet technology is altering industry value chains, spawning substantial opportunities for increasing efficiency and reducing costs, and affecting strengths and weaknesses of business organisations.
7. Environment is sum of several external and internal forces that affect the functioning of business. Businesses function as a part of broader environment. The inputs in the form of human, physical, financial and other related resources are drawn from the environment. The business converts these resources through various processes into outputs of products and/or services. Macro environment is explained as one which is largely external to the enterprise and thus beyond the direct influence and control of the

organization, but which exerts powerful influence over its functioning. Important elements of macro environment are:

- **Demographic environment:** The term demographics denote characteristics of population in an area, district, country or in world. It includes factors such as race, age, income, educational attainment, asset ownership, home ownership, employment status and location. Marketers and other social scientists often group populations into categories based on demographic variables. Some of the demographic factors have great impact on the business. Factors such as general age profile, sex ratio, education, growth rate affect the business with different magnitude.
 - **Economic environment:** The economic environment refers to the nature and direction of the economy in which a company competes or may compete. The economic environment includes general economic situation in the region and the nation, conditions in resource markets which influence the supply of inputs to the enterprise, their costs, quality, availability and reliability of supplies.
 - **Political-Legal Environment:** This is partly general to all similar enterprises and partly specific to an individual enterprise. There are three important elements in political-legal environment are Government, legal and political.
 - **Socio-Cultural environment:** Socio-cultural environment consist of factors related to human relationships and the impact of social attitudes and cultural values which has bearing on the business of the organization. The beliefs, values and norms of a society determine how individuals and organizations should be interrelated. The core beliefs of a particular society tend to be persistent. It is difficult for businesses to change these core values, which becomes a determinant of its functioning.
 - **Technological environment:** The most important factor, which is controlling and changing people's life, is technology. Technology has changed the ways of how business operates now. This is leading to many new business opportunities as well as making obsolete many existing systems. Technology can act as both opportunity and threat to a business.
 - **Global environment:** Today's competitive landscape requires that companies must analyse global environment as it is also rapidly changing. The new concept of global village has changed how individuals and organizations relate to each other. Further, new migratory habits of the workforce as well as increased offshore operation are changing the dynamics of business operation.
8. Although competition makes organizations work harder, intense competition is neither a coincidence nor bad luck. All organizations have competition. The benefit of competition is also enjoyed by the markets in which organisations operate. The customers are able to get products at lower costs and better quality. They get better value of their money because of competition.

To gain a deep understanding of a company's industry and competitive environment, managers do not need to gather all the information they can find and waste a lot of time to digest it. Rather, the task is much more focused. A powerful and widely used tool for systematically diagnosing the significant competitive pressures in a market and assessing the strength and importance of each is the Porter's five-forces model of competition. This model holds that the state of competition in an industry is a composite of competitive pressures operating in five areas of the overall market:

- Competitive pressures associated with the market manoeuvring and jockeying for buyer patronage that goes on among rival sellers in the industry.
 - Competitive pressures associated with the threat of new entrants into the market.
 - Competitive pressures coming from the attempts of companies in other industries to win buyers over to their own substitute products.
 - Competitive pressures stemming from supplier bargaining power and supplier-seller collaboration.
 - Competitive pressures stemming from buyer bargaining power and seller-buyer Collaboration.
9. The term strategic management refers to the managerial process of forming a strategic vision, setting objectives, crafting a strategy, implementing and executing the strategy, and then initiating whatever corrective adjustments in the vision, objectives, strategy, and execution are deemed appropriate.

The basic framework of strategic process can be described in a sequence of five stages as follows:

Stage one - Where are we now? (Beginning): This is the starting point of strategic planning and consists of doing a situational analysis of the firm in the environmental context.

Stage two - Where we want to be? (Ends): This is a process of goal setting for the organization after it has finalised its vision and mission.

Stage three - How might we get there? (Means): Here the organization deals with the various strategic alternatives it has.

Stage four - Which way is best? (Evaluation): Out of all the alternatives generated in the earlier stage the organization selects the best suitable alternative in line with its SWOT analysis.

Stage five - How can we ensure arrival? (Control): This is a implementation and control stage of a suitable strategy. Here again the organization continuously does situational analysis and repeats the stages again.

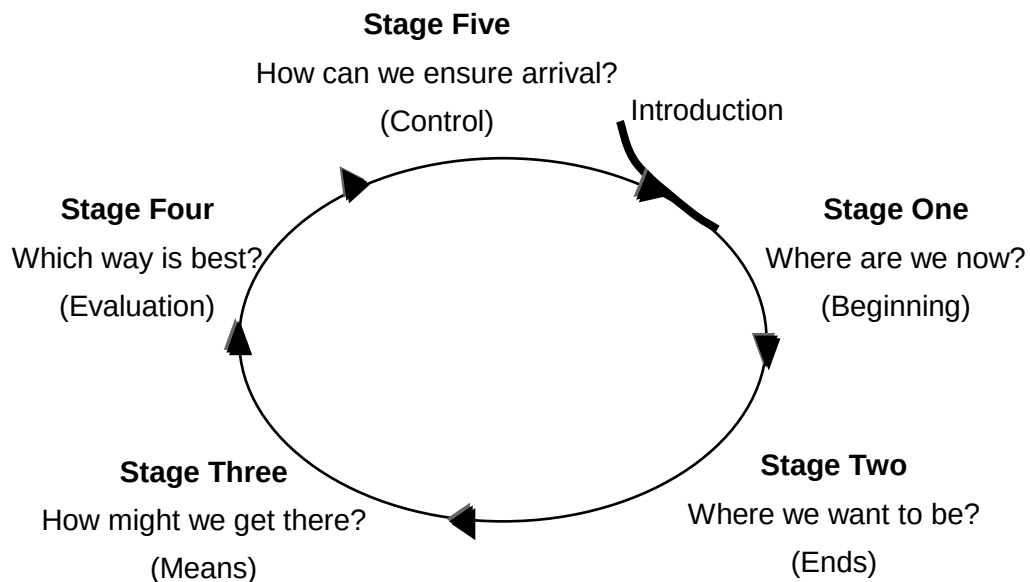


Figure - Framework of strategic management

10. Strategies provide an integral framework for management and negotiate their way through a complex and turbulent external environment. Strategy seeks to relate the goals of the organisation to the means of achieving them.

Strategy may be defined as a long range blueprint of an organisation's desired image, direction and destination what it wants to be, what it wants to do and where it wants to go. Strategy is meant to fill in the need of organisations for a sense of dynamic direction, focus and cohesiveness.

The Generic Strategies

According to Glueck and Jauch there are four generic ways in which strategic alternatives can be considered. These are stability, expansion, retrenchment and combinations.

- (i) **Stability strategies:** One of the important goals of a business enterprise is stability to safeguard its existing interests and strengths, to pursue well established and tested objectives, to continue in the chosen business path, to maintain operational efficiency on a sustained basis, to consolidate the commanding position already reached, and to optimise returns on the resources committed in the business.

- (ii) **Expansion Strategy:** Expansion strategy is implemented by redefining the business by adding the scope of business substantially increasing the efforts of the current business. Expansion is a promising and popular strategy that tends to be equated with dynamism, vigor, promise and success. Expansion includes diversifying, acquiring and merging businesses.
 - (iii) **Retrenchment Strategy:** A business organisation can redefine its business by divesting a major product line or market. Retrenchment or retreat becomes necessary for coping with particularly hostile and adverse situations in the environment and when any other strategy is likely to be suicidal. In business parlance also, retreat is not always a bad proposition to save the enterprise's vital interests, or even to regroup and recoup the resources before a fresh assault and ascent on the growth ladder is launched.
 - (iv) **Combination Strategies:** Stability, expansion or retrenchment strategies are not mutually exclusive. It is possible to adopt a mix to suit particular situations. An enterprise may seek stability in some areas of activity, expansion in some and retrenchment in the others. Retrenchment of ailing products followed by stability and capped by expansion in some situations may be thought of. For some organisations, a strategy by diversification and/or acquisition may call for a retrenchment in some obsolete product lines, production facilities and plant locations.
11. The next component of strategic thinking requires the generation of a series of strategic alternatives, or choices of future strategies to pursue, given the company's internal strengths and weaknesses and its external opportunities and threats. The comparison of strengths, weaknesses, opportunities, and threats is normally referred to as a SWOT analysis:
- **Strength:** Strength is an inherent capability of the organization which it can use to gain strategic advantage over its competitors.
 - **Weakness:** A weakness is an inherent limitation or constraint of the organization which creates strategic disadvantage to it.
 - **Opportunity:** An opportunity is a favourable condition in the organisation's environment which enables it to strengthen its position.
 - **Threat:** A threat is an unfavourable condition in the organisation's environment which causes a risk for, or damage to, the organisation's position.

The significance of SWOT analysis lies in the following points:

- It provides a logical framework.
- It presents a comparative account.
- It guides the strategist in strategy identification.

SWOT analysis helps managers to craft a business model (or models) that will allow a company to gain a competitive advantage in its industry (or industries). Competitive advantage leads to increased profitability, and this maximizes a company's chances of surviving in the fast-changing, global competitive environment that characterizes most industries today.

12. The BCG matrix can be used to determine what priorities should be given in the product portfolio of a business unit. Using the BCG approach, a company classifies its different businesses on a two-dimensional growth share matrix. Two dimensions are market share and market growth rate. In the matrix:

- The vertical axis represents market growth rate and provides a measure of market attractiveness.
- The horizontal axis represents relative market share and serves as a measure of company strength in the market.

Thus the BCG matrix depicts four quadrants as per following:

Market Growth Rate	High	Stars	Question Marks
	Low	Cash Cows	Dogs
		High	Low
		Relative Market Share	

Different types of business represented by either products or SBUs can be classified for portfolio analyses through BCG matrix. They have been depicted as follows:

- (a) **Stars** are products or SBUs that are growing rapidly. They also need heavy investment to maintain their position and finance their rapid growth potential.
- (b) **Cash Cows** are low-growth, high market share businesses or products. They generate cash and have low costs. They are established, successful, and need less investment to maintain their market share.
- (c) **Question Marks**, sometimes called problem children or wildcats, are low market share business in high-growth markets. They require a lot of cash to hold their share. They need heavy investments with low potential to generate cash. Question marks can become stars if properly managed, however, if left unattended they are capable of becoming cash traps.

- (d) **Dogs** are low-growth, low-share businesses and products. They may generate enough cash to maintain themselves, but do not have much future. Sometimes they may need cash to survive. Dogs should be minimised by means of divestment or liquidation.

The BCG matrix is useful for classification of products, SBUs, or businesses, and for selecting appropriate strategies for each type as follows.

- (a) Build with the aim for long-term growth and strong future.
 - (b) Hold or preserve the existing market share.
 - (c) Harvest or maximize short-term cash flows.
 - (d) Divest, sell or liquidate and ensure better utilization of resources elsewhere.
13. Turnaround strategy is a highly targeted effort to return an organization to profitability and increase positive cash flows to a sufficient level. Organizations those have faced a significant crisis that has negatively affected operations require turnaround strategy. When organization is facing both internal and external pressures making things difficult then it has to find something which is entirely new, innovative and different. Once turnaround is successful the organization may turn to focus on growth.

Conditions for turnaround strategies

When firms are losing their grips over market, profits due to several internal and external factors, and if they have to survive under the competitive environment they have to identify danger signals as early as possible and undertake rectification steps immediately. These conditions may be, inter alia cash flow problems, lower profit margins, high employee turnover and decline in market share, capacity underutilization, low morale of employees, recessionary conditions, mismanagement, raw material supply problems and so on.

Action plan for turnaround strategy

- Stage One – Assessment of current problems
 - Stage Two – Analyze the situation and develop a strategic plan
 - Stage Three – Implementing an emergency action plan
 - Stage Four – Restructuring the business
 - Stage Five – Returning to normal
14. According to Porter, strategies allow organizations to gain competitive advantage from three different bases: cost leadership, differentiation, and focus. Porter calls these base generic strategies. Cost leadership emphasizes producing standardized products at a very low per-unit cost for consumers who are price-sensitive. Differentiation is a strategy aimed at producing products and services considered unique industry wide and directed

at consumers who are relatively price-insensitive. Focus means producing products and services that fulfill the needs of small groups of consumers.

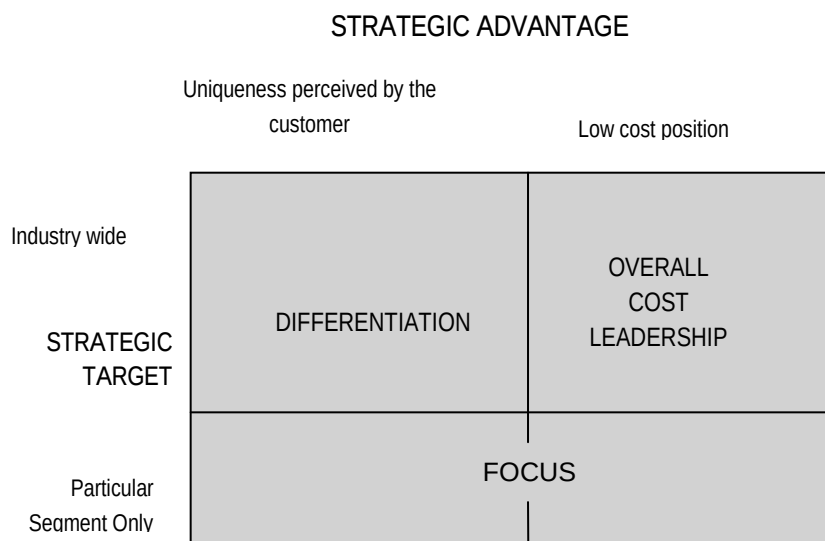


Figure: Michael Porter's Generic Strategy

Cost Leadership Strategies

A primary reason for pursuing forward, backward, and horizontal integration strategies is to gain cost leadership benefits. But cost leadership generally must be pursued in conjunction with differentiation. A number of cost elements affect the relative attractiveness of generic strategies, including economies or diseconomies of scale achieved, capacity utilization and linkages with suppliers and distributors and so on.

Differentiation Strategies

Different strategies offer different degrees of differentiation. A differentiation strategy should be pursued only after a careful study of buyers' needs and preferences to determine the feasibility of incorporating one or more differentiating features into a unique product that features the desired attributes. A successful differentiation strategy allows a firm to charge a higher price for its product and to gain customer loyalty. Special features that differentiate one's product can include superior service, spare parts availability, design, product performance, useful life, or ease of use and so on.

Focus Strategies

A successful focus strategy depends on an industry segment that is of sufficient size, has good growth potential, and is not crucial to the success of other major competitors. Strategies such as market penetration and market development offer substantial focusing advantages. Midsize and large firms can effectively pursue focus-based strategies only in

conjunction with differentiation or cost leadership-based strategies. All firms in essence follow a differentiated strategy.

15. Marketing mix forms an important part of overall competitive marketing strategy. The marketing mix is the set of controllable marketing variables that the firm blends to produce the response it wants in the target market. These variables are often referred to as the “4 Ps.” The 4 Ps stand for product, price, place and promotion.
- **Product** stands for the “goods-and-service” combination the company offers to the target market. Strategies are needed for managing existing product over time adding new ones and dropping failed products. Strategic decisions must also be made regarding branding, packaging and other product features.
 - **Price** stands for the amount of money customers have to pay to obtain the product. Necessary strategies pertain to the location of the customers, price flexibility, related items within a product line and terms of sale.
 - **Place** stands for company activities that make the product available to target consumers. One of the most basic marketing decision is choosing the most appropriate marketing channel. Strategies should be taken for the management of channel(s) by which ownership of product is transferred from producers to customers and in many cases, the system(s) by which goods are moved.
 - **Promotion** stands for activities that communicate the merits of the product and persuade target consumers to buy it. Strategies are needed to combine individual methods such as advertising, personal selling, and sales promotion into a coordinated campaign. In addition, promotional strategies must be adjusted as a product move from earlier stages from a later stage of its life.
16. The term supply chain refers to the linkages between suppliers, manufacturers and customers. Supply chains involve all activities like sourcing and procurement of material, conversion, and logistics. Planning and control of supply chains are important components of its management. Naturally, management of supply chains include closely working with channel partners – suppliers, intermediaries, other service providers and customers.

Supply chain management is defined as the process of planning, implementing, and controlling the supply chain operations. It is a cross-functional approach to managing the movement of raw materials into an organization and the movement of finished goods out of the organization toward the end-consumer who are to be satisfied as efficiently as possible.

Is logistic management same as supply chain management?

Supply chain management is an extension of logistic management. However, there is difference between the two. Logistical activities typically include management of inbound and outbound goods, transportation, warehousing, handling of material, fulfilment of orders, inventory management, supply/demand planning. Although these activities also

form part of Supply chain management, the latter has different components. Supply chain management includes more aspects apart from the logistics function. It involves working cohesively with the channel partners to streamline the flow of materials. It is a tool of business transformation and involves delivering the right product at the right time to the right place and at the right price. It reduces costs of organizations and enhances customer service.

17. *"Strategic control focuses on the dual questions of whether: (1) the strategy is being implemented as planned; and (2) the results produced by the strategy are those intended."*
– Schendel and Hofer

Strategies once formulated are not immediately implemented. There is time gap between the stages of strategy formulation and their implementation. Strategies are often affected on account of changes in internal and external environments of organisations. There is need for warning systems to track a strategy as it is being implemented. Strategic control is the process of evaluating strategy as it is formulated and implemented. It is directed towards identifying problems and changes in premises and making necessary adjustments.

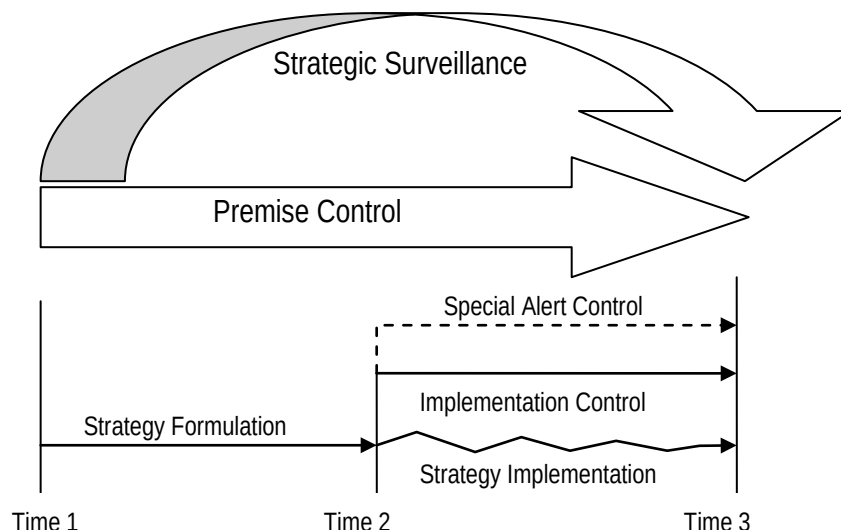
Type of Strategic Control

There are four types of strategic control as follows:

- **Premise control:** A strategy is formed on the basis of certain assumptions or premises about the complex and turbulent organizational environment. Over a period of time these premises may not remain valid. Premise control is a tool for systematic and continuous monitoring of the environment to verify the validity and accuracy of the premises on which the strategy has been built.
- **Strategic surveillance:** Contrary to the premise control, the strategic surveillance is unfocussed. It involves general monitoring of various sources of information to uncover unanticipated information having a bearing on the organizational strategy. It involves casual environmental browsing. Strategic surveillance may be loose form of strategic control, but is capable of uncovering information relevant to the strategy.
- **Special alert control:** At times unexpected events may force organizations to reconsider their strategy. Sudden changes in government, natural calamities, terrorist attacks, unexpected merger/acquisition by competitors, industrial disasters and other such events may trigger an immediate and intense review of strategy. Organizations to cope up with these eventualities, form crisis management teams to handle the situation.
- **Implementation control:** Managers implement strategy by converting major plans into concrete, sequential actions that form incremental steps. Implementation control is directed towards assessing the need for changes in the overall strategy in light of unfolding events and results associated with incremental steps and actions.

Strategic implementation control is not a replacement to operational control. Strategic implementation control, unlike operational controls continuously monitors the basic direction of the strategy. The two basic forms of implementation control are:

- (i) Monitoring strategic thrusts
- (ii) Milestone Reviews



Source: From book "Strategic management-formulation, Implementation and control" by John A Pearce II, Richard B Robinson, Jr. and Amita Mital.

These four strategic controls steer the organisation and its different sub-systems to the right track. They help the organisation to negotiate through the turbulent and complex environment.

18. The phenomenon which often distinguishes good organizations from bad ones could be summed up as 'corporate culture'. Corporate culture refers to a company's values, beliefs, business principles, traditions, ways of operating and internal work environment. Every corporation has a culture that exerts powerful influences on the behaviour of managers. Culture affects not only the way managers behave within an organization but also the decisions they make about the organization's relationships with its environment and its strategy.

"Culture is a strength that can also be a weakness". This statement can be explained by splitting it in to two parts.

Culture as a strength: As a strength, culture can facilitate communication, decision-making & control and create cooperation & commitment. An organization's culture could be strong and cohesive when it conducts its business according to a clear and explicit set

of principles and values, which the management devotes considerable time to communicating to employees and which values are shared widely across the organization.

Culture as a weakness: As a weakness, culture may obstruct the smooth implementation of strategy by creating resistance to change. An organization's culture could be characterized as weak when many subcultures exist, few values and behavioural norms are shared and traditions are rare. In such organizations, employees do not have a sense of commitment, loyalty and sense of identity.

19. Implementing TQM requires organization wide support. There are several principles that guide success of TQM. Various principles that guide the total quality management philosophy are as follows:

- A sustained management commitment to quality
- Focusing on the customer
- Preventing rather than detecting defects
- Universal quality responsibility
- Quality measurement
- Continuous improvement and learning
- Root cause corrective action
- Employee involvement and empowerment
- The synergy of teams
- Thinking statistically
- Inventory reduction
- Value improvement
- Supplier teaming
- Training

20. Business Process Reengineering (BPR) is an approach to unusual improvement in operating effectiveness through the redesigning of critical business processes and supporting business systems. It is revolutionary redesign of key business processes that involves examination of the basic process itself. BPR refers to the analysis and redesign of workflows and processes both within the organization and between the organization and the external entities like suppliers, distributors, and service providers.

BPR involves the following steps:

1. **Determining objectives and framework:** Objectives are the desired end results of the redesign process which the management and organization attempts to achieve.

This will provide the required focus, direction, and motivation for the redesign process. It helps in building a comprehensive foundation for the reengineering process.

2. **Identify customers and determine their needs:** The designers have to understand customers – their profile, their steps in acquiring, using and disposing a product. The purpose is to redesign business process that clearly provides added value to the customer.
3. **Study the existing process:** The existing processes will provide an important base for the redesigners. The purpose is to gain an understanding of the 'what', and 'why' of the targeted process. However, some companies go through the reengineering process with clean perspective without laying emphasis on the past processes.
4. **Formulate a redesign process plan:** The information gained through the earlier steps is translated into an ideal redesign process. Formulation of redesign plan is the real crux of the reengineering efforts. Customer focused redesign concepts are identified and formulated. In this step alternative processes are considered and the best is selected.
5. **Implement the redesign:** It is easier to formulate new process than to implement them. Implementation of the redesigned process and application of other knowledge gained from the previous steps is key to achieve dramatic improvements. It is the joint responsibility of the designers and management to operationalise the new process.