SUPER SUMMARY

INFORMATION TECHNOLOGY

FOR CA-IPCC
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CRASH NOTES

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CONTENTS

1. Basic Concepts
Unit 1: Introduction To Computers....3
Unit 2: Input & Output Devices....7
Unit 3: Software....10
2. Data Storage, Retrieval And Data Base Management Systems....13
3. Computer Networks And Network Security....20
4. Internet And Other Technology....27
5. Introduction Of Flowchart....31
6. Decision Table....333
7. Differences....34

Features:

- Point to point discussion of the content
- Based on new publications issued by ICAI
- Covered all concepts of syllabus
- Very useful for last time revision
- As per new contents added by ICAI

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" Life Is Not A Race, Take It Slower. Hear The Music, Before The Song Is Over... Live To Live! Tomorrow Is Not A Guarantee..."

1. BASIC CONCEPTS

Unit 1: Introduction to computers

Definition of computer:	Electronic Data Processing device capable of receiving input, storing sets of instructions for solving problems and generating output with high speed and accuracy.

Generations of computer[35]	*First*	1940-1956	Vacuum tube (UNIVAC First General purpose Electrical Computer)
	Second	1956-1963	Transistors and others solid state devices (than IBM Series came into market)
	Third[38]	1963-1971	Integrated circuits (this circuits are combination of transistors)
	Fourth[38]	1971-1990	Large Scale Integrated Circuit (LSI), (Use of LAN, WAN started)
	Fifth	1990-beyond	Ultra Larges Scare Integrated Circuits (ULSI contains > 1 million Transistors),Artificial Intelligence and Parallel Data Processing (PDP)
They Vary in Density, cost, size, memory, speed, technology, other features			

Classification of computers[25]	
Analog Computer [34]	It is a form of computer that uses continuous physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved. Unable to Numerous calculation simultaneously, used in Engineering. (display is like in calculator)
Digital Computer [34]	A computer that performs calculations and logical (<,>,=) operations with quantities represented as digits, usually in the binary number system. Used in Reservation system
Hybrid Computer	A combination of computers those are capable of inputting and outputting in both digital and analog signals. Less expensive than Digital computer. Used to Measure Heart Beat.
Super Computer[39]	Largest and fastest, most expensive computer used in specialized areas such as in Defence, Aircraft design, Movies, Weather research. They derive speed from the use of Multiprocessors. Speed is measured in GIGAFLOPS. Support 10,000 terminal at a time
Mainframe Computer[39]	Composed of several computers in addition to Mainframe/host processors. Host Processor controls other processors, front end processor handles communication from remote terminals, and back end processor retrieves data. Used in Airline Booking, Network Banking, etc. Support more than 1000 terminals. Speed in MEGAFLOPS
Mini Computer	Slower and smaller than mainframes but perform same task as mainframes. Not big as mainframe computer but offer equal offer. Higher processing capability than Micro Computers. Cheap, Fast support high level language. Support upto 32 Terminal. Used in Accounting, Billing, Inventory, etc.
Micro Computers [37]	Smallest category of computer, consist of Microprocessor (CPU) and associated storage and input/output elements. Also called as Personal Computer. Inexpensive, low storage capacity therefore uses interpreter to high level language, small in size, Support Multi-user and Multitasking. Consumes less power. Have limited capacity.
Workstations [37]	Workstation is a powerful Microcomputer (PC) designed for technical or scientific applications. Its CPU uses Reduced Instructions Set Computing (RISC) and is used by scientists and engineers. Run in UNIX OS or variation of it. Used for Computer-Aided Design (CAD) and used as server for Local Area Network (LAN).
Server	Provide services to other computing system called clients over a network. Operates on Network. Hardware may me identical to PC's but software is often very different.

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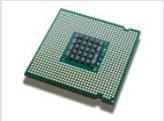
Advantages of computers	Disadvantages of computers
Speed, Accuracy, Reliability, Storage, Automation, Versatility (more than one task), Communication, Diligence (work for Several Hour), No Feeling, Consistency.	Programmed by human, No Intelligence, No decision making power, Emotionless, Curtail human capabilities.

Components of computer		
CPU (Central Processing Unit) Heart of the computer 1. Connected through BUS. 2.Contained in tiny chips called Microprocessor 3. CPU is using Technology called as VLSI, ULSI. 	*Control unit*[69]	Manages/Supervises the resources of computer system, by executing set of instructions. Act as Central Nervous System. Send electronic Impulses to ALU and storage Devices. (eg- When to start printing)
	Arithmetic Logical Unit (ALU)[69]	Arithmetic operations include addition, multiplication, subtraction and division. Logical operations include comparison such as equal to, greater than or less than.
	Features:	Clock speed- Speed at which processor (CPU) executes information. Measured in MHz or GHz. Higher the clock speed faster the CPU. Cache Memory[42]- High speed memory devices used to increase processing speed by making available for current programs and data to CPU at faster rate. L-1 Cache, which comes with processor, is very fast. L-2 Cache placed in the motherboard is comparatively Slower. L-3 Cache is extra cache built in motherboard between the Microprocessor and Main Memory (slower). Architecture- CPU's architecture determines the manner in which it processes data. New CPU employs multi-staged Pipelines in its architecture for transmitting data. Slot- Sockets/slots are used to fit different processors on the mother board. Two Main types are Socked 7 and Slot 1. Density- Shorter distance between two transistors on CPU will increase performance and speed. MMX- Multimedia Extensions: Set of instruction built into CPU to improve Multimedia or Graphic Applications performance.
Mother Board Main Circuit Board on computer, acts as a direct channel for various component to communicate	*Components of motherboard*	Processor Slot:- 1. BIOS- small chip on MB which load the hardware setting. 2. CMOS- memory Chip that stores date, time, setup-parameter. 3. Power Supply Connector- allow to connect power on MB. Expansion Slots:- (Used to connect diff device on MB) 1. ISA (Industry Standard Architecture)- Enable BUS[39] to connect with other peripherals devices. 2. SIMM/DIMM- Used to connect RAM on MB. 3. PCI slots(Peripheral Component Interface)-PCI based device 4. AGP Slots (Accelerated Graphic Ports)-connect Graphic Card 5. SCSI (Small Computer System Interface)- Extension Cord Cards:- 1. Sound Card- Used in Multimedia app. Used to record sound, gives output for sound. Convert Electric signal into Sounds. 2. Video Card- allow computer to display video and animation. 3. Network Card- allows computers to connect with each other. Ports and Connector[42]: - They help to Connect external devices.

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		1. Parallel and Serial Ports:- transmit data parallel or serially 2. IDE(Integrated Drive Electronics) drive Connector (IDI controller) 3. Floppy Drive Connector:- facilitating data exchange with floppy 4. USB Connector:-Provided higher data transfer speeds for diff USB devices like Keyboard, mouse, scanner, Flash Drives. 5. PS/2:- used to connect PS/2 input devices like Keyboard, mouse.	
Storage Devices 1. Storage means area where program instruction and data are retained for processing. 2. CPU has no capability to store programs/ large sets of data Permanently.	*Primary[48] Storage Devices[41,42]* *Directly connected to CPU for the Functioning of CPU* *Also known as Main Memory*	Random Access Memory (RAM)[40] 	Volatile memory constructed with Metal-Oxide Semi Conductor Storage elements (MOS) that temporarily store dynamic data to enhance computer performance. Two types of RAM are – 1. Dynamic[40]:-contains a transistor that acts as a switch and a capacitor, which is capable of storing electric charges. Requires periodic refresh to clear memory. 2. Static[40]: - faster, larger and more expensive than Dynamic RAM. It never needs to be refreshed. Cache Memory
		Read Only Memory (ROM)[40]	Provide permanent memory storage i.e. data can only be read from such memory but cannot be written. Data stored in ROM chips are generally recorded when the chip is manufactured. Three types of ROM are –PROM[69], EPROM, and EEPROM.
		Bubble Memory[69] 	Small magnetic bubbles formed on a thin single crystal film of synthetic garnet are used to store the data permanently. It is non-volatile memory, small, light weight therefore used in Portable Computers.
		Flash Memory 	Non-Volatile memory, where data can be erased electrically. Form of Static RAM. They primarily used in memory cards, USB flash drives, and solid-state drives for general storage. No moving parts. Very Fast.
		Video RAM	Used to accelerate the display of graphics on the screen. Help in data transfer between two ports one connected to CPU another to Screen.
	Secondary[48] Storage Devices: Stores the data permanently in millions and billions of bytes.	Tape Device[48]	Magnetic tape is an external storage device that can be used for making copies of audio, video, and data. It is a secondary storage device that is capable of storing and accessing data sequentially. *Types:* Detachable Reel Magnetic Tape and Tape Cartridge System.
		Floppy diskette	Portable Storage Device, which consist of a flexible thin plastic sheet. 3.5 inches, 1.44 MB diskette has a total of 2880 sectors (80 tracks per side × 2 side's× 18 sectors per track). Very low memory
		Magnetic Disc[48] (HARD DISK)	It is Direct Access Medium but Data Retrieval is slower than Main Memory. It is a stack of one or more metal platters that spin on one spindle like a

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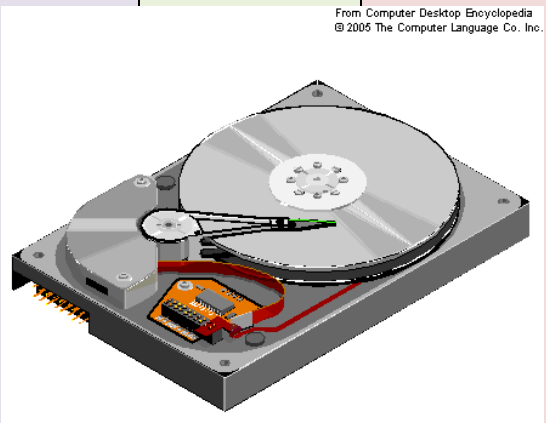

stack of rigid diskette.

Finding Data on a Disk

A Computer O/S is able to located data on a disk because each track and sector is labelled, and the location of all data is kept in a special log on the disk. The labelling of tracks and sectors is called Formatting, which result in creation of four disk areas:-

1. Boot Record: Small record that runs when the computer is started which check the availability of O/S to run System Successfully.
2. File Allocation Table (FAT): Log which records the location of each file and status of each sector.
3. Root Folder or Directory is a index to organize file on the disk contain the file name and pointer track file
4. Data Area: Dist part which remains free after Boot Sector, FAT, Directory is created. (Free Space)

Operations:

Data storage consists of 3 components namely

(a) Seek Time is the time required to position a head over the recording track to be used.

(b) Rotational Time is the rotational delay (Latency)

(c) Data Transfer Time is the time taken to activate head and to transmit requested data to Primary Memory.

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Optical Laser Disk

Store vast amount of data using optical laser beam that writes to the recording surface by scoring macroscopic pits in disk and another laser reads the data from the light sensitive recording surface.

1. CD-ROM Disk: Data is already encoded and hence only be read and cannot modified.
2. WORM Disk: permit user to write information that will not be changed; the user can read the data many times. Used in Image processing sys.
3. Magneto–Optical Disk: Hybrid of magnetic and optical tech. Enable read and write storage
4. Digital Video Disk: DVD closely resembles CD-ROM only pits are encoded much closer which provide larger storage. DVD-5, 10, 9, 18.
5. Blu Ray Disc: It enables recording, rewriting and playback of HD Videos. Provide 5 times more storage capacity than DVD's and can hold upto 25 GB of information on single layer & 50 GB on dual layer disk.

Unit 2: Input & Output Devices

Definition of Input Device:	A device that is used to feed the data or information from outside world into the computer system.

Types of Input Devices:			
On-Line Entry (The device that is connected directly to the CPU and Communicates with it directly.)	1. Key board: Similar to typewriter, when keys pressed, they are converted into BCD. 2. Mouse: Mechanical Device with buttons on top for input and laser beam at bottom. 3. Touch Screen: Video Display Screen, having Photo Detector for receiving input. 4. Light Pen: Used to draw or points items on the display screen. Having PD at its tips. 5. Track Ball: Movable ball on a top of stationary device, which can be rotated as cursor. 6. Joy Stick: Is a vertical stick which moves the graphic cursor in a direction stick is moved. 7. Scanner: Used to scan image, printed text, etc and convert into digital image. 8. Camera: Digital Camera (takes digital images), Web Cams is VCD connected to Computer. 9. Microphone & Speech recognition: used to capture sound as input. 10. Digitizing Tablets: allowing drawing images and graphic (same as pencil paper mode). 11. MIDI Devices: Musical Instrument Digital Interface, designed to transmit Info. Between electronic musical instrument. Captured as sequences of notes by Computer (instead of recording digitized sound waves).		
	Types of Display Devices		
	Different Types of Computer Terminals (Terminal:- Input/output device connected by telecommunication links to a computer)	Dumb Terminal[44]	Provides for data entry and information exit. Do not have processor and storage. Totally dependent on Computer. No additional capability.
		Intelligent Terminal[44]	Having built-in processing capability storage area through Microprocessor. Can be used on a stand-alone basis. Do not have Internal storage.
		Smart Terminal[45]	Having Microprocessors and some internal storage. It has data editing capability and can consolidate input data.
		Remote Job Terminal[44,45]	Group data into blocks for transmission to a computer from remote site. Also known as RJE.
		Keyboard Printer Terminal	Consists of a key board for sending information to the computer and a printer for providing a copy of the input and for receiving information from the computer.
	FEATURES OF DISPLAY DEVICES		
	Factors that control the quality of image on Visual Display Device	1. Screen resolution: Character formed on the screen are made up of tiny dots called Pixels, which form a rectangular pattern. 2. Video Adapter Card: Provides an interface between the computer and monitor. 3. Text and Graphics: Text output is composed entirely of alphabetic, character, etc. Graphics output includes drawing, 4. Video Controller: It has circuit board, which sends information to the monitor and is connected to the MB. 5. Memory: The no. Of bits available to each pixels depends upon the resolution and the amt of installed video memory.	
	Visual Display Device	1. It is a device which visually conveys the Texts, Graphics, etc 2. The Information displayed on the device is known as the soft copy since it exists electronically and displayed only for a temporary period of time.	

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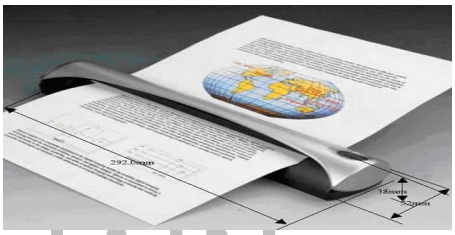
			3. TYPES: Cathode Ray Tube (CRT) Vs Flat-Panel (LCD, Plasma Display).
Direct data Entry	Entry of data directly into the computer through machine readable source documents.		
	Types:	Magnetic Ink Character Recognition (MICR)[45]	Combination of magnetic & paper media. In which characters are printed in special ink. This substance can be read, decoded and entered into CPU. Cheque
		Optical Character Recognition (OCR)[45,46]	Light scanning technique used to produce light dark pattern. Component of OCR Device: A Transport Mechanism, Scanner and Recognition Unit. Legal Doc 
		Optical Mark Recognition (OMR)[46]	Use photo-electric device, which recognizes character by absorption on the document. It is commonly used for scoring tests. In CA CPT EXAM.
		Smart Card System	It contains a microprocessor chip and memory to store the data. Look like Credit Card
		Bar Code Reader	A light sensitive detector identifies the bar code image using laser beam. Used in Billing
		Image Processing	It captures an electronic image of data to be stored and shared. It includes Data Capturing, Indexing, Storage, Retrieval, and Output. Advantage of Image Processing:- Accuracy and availability, Simultaneous Access, Capacity and Cost, Customer Satisfaction, Security, Speed, Versatility.

Types of Output Devices:	
Monitor[43]	Monitors are video display terminal that displays the processed data, which the users can view on screen of different sizes. Two types of computer monitors are - CRT and Flat panel.

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Printers	Printers are devices that produce hard copies of information stored in computer on to the papers or on transparencies or on other media.		
	Impact Printer[46]	Serial Printers[47]	Dot-matrix printer, Daisywheel printer.
		Line Printers[47]	Chain Printer, Drum printer.
	Non-Impact Printer[46]	A printer does not strike a print head on the ribbon and form the character by chemical or electronic means. The various types of Non-impact printers are Thermal printer, Ink-Jet printer and Laser printer and Multifunctional printer.	
	Characteristic	Speed, Quality of Output, Capacity, Direction (Uni,Bi)	
	Multifunctional Printer	It is single device that serves several functions such as printer, scanner, fax machine and photocopier. ALL in one device	
Computer Output Microfilm	It is an output technique which records output from a computer as Microscopic Images on rolls or sheet film.		
Microfilm Vs Microfiche[47]	Microfilm	Microfiche	
	1. Stays in a continuous form. 2. Provide Sequential Access. 3. Cartridges Hold upto 5000 pages	1. Is cut into Pieces 2. Provide Direct Access. 3. Film holds more than 270 pages.	
Speakers	The sound card translates digital sound into the electric current that is sent to the speakers for the purpose of producing output.		
Graph Plotter	A device capable of tracing out graphs, designs and maps into paper (draw lines).		

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Unit 3: Software

Definition of software[38]:	A set of instructions, which is known as program, are combined together to perform specific task.

Types of software:		
System Software[52]	Comprises of those programs that control and support the computer system and its data processing applications. It set of one or more programs designed to control the operation of computer system.	
	Types of System Software	1. Programming Languages: Used to create/write Programs or Software. 2. Operating System: Master control program of a computer that manages its internal function, work in multi-programming mode. Provides various support service. Control I/O Function of the Computer 3. Sub-Routine: Section of a computer program that is designed to perform a specific task. It is set aside from the rest of the code in a program. 4. Utility Program[49]: Basic Program provided by the computer manufacturer to all the user installations 5. Diagnostic Routine: They assist in debugging the programs by providing a printout of the contents. Helps to identify the hardware accessories. 6. Language Translator: Translation program written and supplied by the computer manufacturer and are used to translate a program.
	TYPES OF PROGRAMMING LANGUAGE	
	1. Machine Lang. Program instructions which are actually read and acted on by the Computer's Processing Circuitry. Integrated Circuit were used to write Machine Lang 2. Assembly Lang. Known as Symbolic Lang. Assembler program is used to convert assembly lang. Into Machine Codes. 3. Compiler Lang. When program has been written, it is translated to the equivalent machine codes by a program called compiler. Resulting codes will be saved separately. 4. 4th Gen Lang. HLL than compiler language which are designed to work with an application producing spectacular effects with minimum programming efforts. 5. Object Oriented Programming. (OOP) It is a tech. for creating common building blocks of a program called object and assembling different sets of objects to solve specific problem.	
	OPERATING SYSTEM	
	Functions of O/S:	Schedule Jobs, Manage H/W and S/W resources, Maintain system security, multiple user resource sharing, Interrupts handling, Maintain usage records.
	File	File is a collection of related data, saved on a specific area of the storage medium
	Directories	Directories are local storage units which enables the computer user to group desired file.
	GUI	Graphical User Interface is a user friendly design for the part of a program that interacts with the user and uses icons to represent program features.
	Types of O/S:	MS-DOS, OS/2, Microsoft Windows (Windows 95, Windows 98, Windows NT, Windows 2000, Windows XP, Windows Server, Windows Vista, Windows 7.0), Mac OS(Apple),UNIX & LINUX (Red hat).
	Features of O/S:	1. Multiprogramming[50]- Execution of two or more programs that reside in primary storage. 2. Foreground- (High-Priority) / Background (low-Priority) processing

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		3. Multi-Tasking[50]- Ability to execute two or more of single user's task 4. Virtual Memory- A program and its data are broken into pages. Only those pages needed in primary memory at any one time are loaded, other pages are kept on Secondary storage devices. 5. Multiprocessing- A system which features more than one CPU. 6. Multi Threading- An application implemented as a separate process with several threads of control. 7. Time Sharing[50]- A Methodology to satisfy the processing needs of Multiprogramming and Batch Operating System.
	Device driver:	Small files that act as an interface between hardware in a computer system and the operating system (OS). Hardware requires device drivers so that the OS can see the devices and handle then effectively and efficiently.
	Types of Utility[49] Programs: *Programs that comes with OS or as a separate package and help in maintaining and improving the efficiency of a Computer System.*	1. Sort Utilities- sorts the data keyed in according to a key field. 2. Spooling software- used for dynamic job processing(in printing) 3. Text editor[70]- Programs for writing and editing text. 4. Disk copy program 5. File copy program 6. Disk formatting program 7. File deletion program 8. File viewing program 9. Debugging program- assist in program debugging (error solving). 10. Directory program.
	Language[51] Translators[49]	1. Compilers[53]- Compiler translates from source language to machine language before the program is executed. 2. Interpreter[53]- Translators for a High level[54] programming lang. that translates and runs program at the same time. 3. Assembler- Translates assembly language to machine language is called an Assembler.
General Purpose Software[37]	Provides framework for business, scientific and personal applications. Eg- Spreadsheet. Types of General Purpose Software are:- 1. Commercial Software- Software which is available through software stores and through the internet in pre-packaged form. (have to Purchase) 2. Shareware- Developed by individual and small companies that cannot afford to market their software worldwide or wants to release a demonstration version of their commercial product. (Demo Version) 3. Open Source Software- Created by generous programmers and released into the public domain for free usage.	
	Word Processor- Text Editor with facilities of formatting. Spread Sheet Program- Used to organize, calculate and analyse numerical data. It is a matrix of rows and columns. Has inbuilt functions and formulas. DBMS- Is a computer program which program, which organizes data in database, providing information storage, organisation, and retrieval capacities, including simultaneously access to multiple data base through a shared field. Internet Browser- Is an application program that provides a way to look at and interact with all the information on the World Wide Web. E-mail- Electronic Information handling technique in which the transmission of messages or letter in electronic.	

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Application Software[52]	It employs the capability of the computer to perform task given by the user. Satisfy user needs. Provide a platform where a particular problem is solved. It ranges from Payroll software, Accounting software, Inventory control, CAD, CAM, ERP etc.		
	Enterprise Resource Planning (ERP)	Integrates all data and process of organization into a single unified system that covers wide range of applications in the organization such as Manufacturing, Supply chain, Financials, CRM, HRM and Warehouse management.	
	Decision support Software (DSS):	Information processing system used by accountants, managers and auditors to assist them in the decision-making process.	
		Characteristics	Combine data, analytical tools and user friendly software to support Unstructured decision-making.
		Components	User- a manager who has an unstructured problem to solve Database- contains routine as well as non-routine data from both internal & external sources. Model Base- The model base of DSS performs data manipulation and computation with the data provided to it by the user and the database. Planning Language- General/Special purpose planning Language
	Artificial Intelligence[58]:	AI is the computer science field which tries to improve computers by endowing them with some of the characteristics associated with human intelligence like capacity to understand natural language. Types: Natural language, Voice Synthesizers, Voice Recognition Systems, Neural Network (system that simulates Intelligence).	
	Expert System *(Programming computer to make decisions in real Situation)*	A computerized information system that allows non-experts to make decisions comparable to those of an expert.	
		Components	Knowledge base, Inference engine, User interferes, Explanation facility and Knowledge acquisition facility. These are used to solve complex tasks which require experience and specialized knowledge in specific subject areas. Eg. Disease diagnosis based on symptom's

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FUN PAGE: *Steve Jobs*	
Apple CEO Steve Jobs, the man behind the first personal computer, died Wednesday at 56 after a long battle with cancer. The innovative genius revolutionized the technical world with the iMac, iTunes, iPod and iPhone. Apple guru Steve Jobs was born in San Francisco and was adopted by Paul and Clara Jobs. The Jobs family later adopted a daughter, Patti. Steve Jobs' biological father, Abdulfattah John Jandali, was of Syrian descent, and his biological mother, Joanne Schieble (later Simpson), was of German ancestry. Jandai is a political science professor and Schieble a language pathologist. Steve never met his biological dad - who had previously expressed a desire to see his genius son. Jobs' relationship with Bay Area painter Chrisann Brennan yielded his first daughter, Lisa Brennan-Jobs, born in 1978. Steve initially denied he was the father, claiming he was sterile. The Apple CEO later acknowledged Lisa as his daughter, even naming the Lisa computer (the "Apple III") after his first-born.	 *(24-02-1955 to 05-10-2011)* *Steve Jobs with iPhone 4S*

2. DATA STORAGE, RETRIEVAL AND DATA BASE MANAGEMENT SYSTEMS

Number system	Represent the numbers, alphabets and the special characters which are converted into 0s and 1s, so that computer can understand to do the task.	
	Representation	Fixed Point: All numbers are represented as integers or fractions. Decimal point to be placed by user, represented in normal form. Eg. Multiplication of 2.4 & 3.2 represented as 24*32=768 Floating Point: It automatically keeps tracks of the decimal point. Number which has both an integer parts and a fractional part is called real number or a floating-point number. There number can be either positive or negative, represented in scientific form. Eg. The number 145.65 will be represented as $0.14565*10^3$
Coding Schemes (How computer understand the Input)	BCD(Binary coded Decimal system)–6-bit code (2^6 ways of representing digit), NO PARITY*[68] BIT. *Parity Bit: also known as check bit, it is the left most bit that is not used to represent character. ASCII (American Standard Code for Information Interchange)-7 bit code (2^7 ways of representing digit), each digit in a numeric value is stored in a single byte. Use Parity Bit. EBCEDIC (Extended Binary Coded Decimal Interchange Code)-8 bit code (2^8 ways of representing digit, alphabet, special symbols). Packing of more than one digit into a byte. Unicode- 16 bit code (2^{16} ways of representing different characters inside the computer). The first 256 codes in Unicode are identical to the 256 codes used by ASCII System.	
Conversions	BCD conversion($)_2$, Octal conversion ($)_8$, Hexadecimal conversion ($)_{16}$ or Decimal ($)_{10}$	
Differences Between BIT and BYTE?[35]		

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Data Types[54] (Determines the possible type's values for that Field, which offer various ways of defining, implementing and using them. Different data type systems ensure varying degrees of safety).	1. Integer Number: It can hold a whole number, but no fraction. Integer may be signed (negative) or unsigned (positive). 2. Logical: It is the efficient way to store data as it has two values. Logical Data is stored as true (.T.) or false (.F.) 3. Character: This data type is chosen when it is required to include letters, number, spaces, symbols and punctuation. Character fields or variables stores text information such as names, addresses and numbers that are not use in mathematical calculation. 4. String: Represent long character. The dollar sign($) type-declaration character represent a String. Fixed (upto 63K), Dynamic (upto 2 billion). 5. Variables: A variable is something that may change in value. Can store anything like temperature, words, exam marks, etc. 6. Memo data: It is used when there is need to store more than 255 character but up to 65,536(2^{16}) character. For storing long document.
Single/Double Precision Data	Real data values are commonly called single precision data because each real constant is stored in a single memory location. This usually gives 7 significant digits for each real value. Each double precision is stored in two memory locations usually 14 digits. Thus it provides twice as many significant digits.
KEY (A key is a set of one or more columns whose combined values are unique among all	1. Candidate Key: Any set of one or more columns whose combined values are unique among all occurrences (i.e tuples or rows). Null value is not guaranteed to be unique, so no component of a candidate key is allowed to be null. 2. Primary Key: It is a candidate key which database designer arbitrarily designates as "primary". It is a data field which is selected as a means by which all data is sorted. It may be selected for convenience, performance, any reason. There is no duplicity of data in the field which is selected as Primary Key.

occurrences in a given table)	3. Alternate Key: Candidate key, which are defined as primary key but not currently selected for the purpose, are called alternate key. (eg Roll no.,etc) 4. Secondary Key: Candidate Key, which are not selected or defined as a primary key is known as Secondary Key. It may have Duplicated Values. Table is first sorted on the basis of Primary Key then on the basis of Secondary key. 5. Referential Integrity: It is a feature provided by RDBMs which prevent users/application from entering inconsistent data. Most RDBM's have various referential integrity rules that can be applied when creating relationship between two tables. Also known as Foreign Key. 6. Index Fields: They are used to store relevant information along with a document, which are used to find the document when needed. 7. Currency Fields: These automatically display the data entered as currency amounts ($,etc). They may have Scroll bar attached to change value. 8. Date Field: These automatically display data entered in date format. 9. Integer Field: These automatically display data as a whole number. 10. Text Field: These display data as an alpha-numeric text string.

Data Processing[34,35]	A series of actions or operations that converts data into useful information. It is done either manually or using computers in such a manner that it produces useful information. It increases the usefulness and the value of the data.
Data Storage Hierarchy:	1. Character: Consist of letter (a,b,c..), Numeric digit(0,1,2...) or special character. 2. Field: Collection of related character, it is the smallest logical data entity that is treated as single unit in data processing. 3. Record: It is collection of related filed that are treated as a single unit. 4. File: Number of related records that are treated as a unit form a file. 5. Database: Number of related file collectively called as Database.

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File Organization[67]:			
Operation in Data Processing	1. Recording is transcribing data into a permanent form. 2. Classifying is grouping of like terms or transaction according to alphabetic/numeric. 3. Sorting is arranging of data in a sequence. It may be done either by numeric/alphabetic. 4. Calculating is an arithmetic operation (add, subtract, etc) to produce desired result. 5. Summarizing means the data are reduced into a meaningful or concise form. 6. Reporting is the last step where the summarized data is presented to Management.		
Data Access Method	Sequential Access	Method in which data is accessed in the sequences in which they are stored. All records are kept in ascen/descending order eg: Tape device	
	Direct Access	In this method (random access) access of data is independent of the storage sequences and can be accessed at random, in no particular order or sequence. Eg Magnetic Disk (Hard disk, Memory card)	
Data Organisation Method (How data will be stored in computer?)	Serial :	Records are arranged one after another, in no particular order.	
	Sequential[54,56]	Records are arranged one after another in an ascending or descending order determined by the key field of the records.	
	Direct Access:	*Direct Sequential Access[54]:*	1. Self direct addressing[54]: the data are stored physically according to the Record Key. Record address can be computed directly from the record key. This method is used where voluminous data are to be stored or when length of record is fixed. 2. Index sequential addressing method[54,56]: hybrid of sequential and Direct (Random) Access Method. Index is maintained with key to provide sequential as well as direct access, no need to sequence the transaction.

		Random Access Organisation:	In random access method, transaction can be processed in any order written at any location through the stored file. To access file prior record need not to be examined first, since the CPU goes directly to the desired record using Randomizing Procedure(tech. converting Record key number to the physical location represented by a disk address through calculations procedures 1. Address generation method: 2. Indexed random method.
Best File Organization's factors	How file will be organised depends on following factors:- 1. File volatility: no. Of additions and deletion to the file? 2. File activity: Proportion of record accessed on a run? 3. File interrogation: If retrieval of individual record must be fast? 4. File size: If required to access large file or small file? Eg: if addition or deletion is high then Direct Access method is appropriate.		

Database Management System (DBMS)[64]	A set of software programs that controls the organization, storage, management, and retrieval of data in a database, including simultaneous access to multiple data base through a shared field. It is a tool to get fast information within an organisation. Eg. In Banking customer detail, balance stored in computer Functions: data pooling, Security, File Interrogation, Large Storage, data transfer, etc.
Management Problem of File Processing:	◈ Data duplication, ◈ Lack of data integration, ◈ Data dependence, ◈ Data Integrity and Security.
Benefits of DBMS:	◈ Reduce data redundancy and Inconsistency, ◈ Enhance data Integrity, ◈ Provide logical and physical data independence, ◈ Provide application data independence, ◈ Reduce complexity, ◈ Provide faster data accessibility and improved data sharing, ◈ Increased productivity, Low cost of developing and maintaining system.

USHANT JAIN

Database[64]	Database is a collection of related information about a subject organised in a useful manner that provides a base or foundation for procedures, such as retrieving information, drawing conclusion, and making decisions.
3 Levels of Database Architecture	◈ External or User view (viewed by chairman, or the operational manager, or the data entry operator)

	◈ Conceptual or Global view (viewed by the DB administrator. Represent entire database and all relationships, constraints and boundaries) ◈ Physical or Internal view (It indicate how data will be stored. It is the lowest level of data abstraction).
Data Independence	In a database an ability to modify a schema definition at one level is done without affecting a schema in the next higher level. (Logical and physical Independence)
Parts of DBMS	Data, Hardware, Software, Users- Application Programmer, End User, Database Administrator, Database Designer.
Record relationship	◈ One-to-One, ◈ Many-to-One, ◈ One-to-Many ◈ Many-to-Many.

Structure of database (is the definition of the data records in which information is stored)		
Hierarchical Database Structure	Records are logically organized into a hierarchy of relationships and involve an inverted tree structure that implements one-to-one and one-to-may relationships. (ROOT-→PARENTS-→CHILD, no element has more than one parent)	
Network Database Structure	Modified version of Hierarchical Database. In network database, each node ma have several Parents. It is useful for creating one-to-one, one-to-many & many-to-one network structures. Very difficult to develop this structure.	
Relational Database Structure	In this Structure, data are organised in two-dimensional tables(known as relation), which can be describe mathematically. As different users see different sets of data and different relationship among them. A table is a collection of records and each record in a table contains the same fields.	
	Advantages: It is highly flexible to program and retrieve data. Easier to Use.	Disadvantages: Processing efficiency is relatively low, high space requirement.
Other database model:	Distributed database, E-R database, Object-oriented database, Client-server database, Knowledge database.	
Types of database:	◈ Operational Database ◈ Management Database ◈ Information Warehouse Database ◈ End-user Database	◈ External Database ◈ Text Database ◈ Image Database

LIGHI ANT JAIN

Components of databases:		
DLL *(Data Link Layer)*		Defines the conceptual schema providing a link between the logical and physical structure of database.
DBMS Languages[63]	DDL (Data Manipulation Language)	Is used by the Database Designer and Programmers to specify the content and structure of the database. Help to set relationship among logical and physical structure database and to set name, data types of the field and to assign KEY.
	DML *(Data Manipulation Language)*	Enables the user and application program to be independent of the physical data structures using manipulation techniques like deletion, modification, insertion of data or records.

Structure of DBMS:	◈ DDL Compiler (convert data definition statements into set of table) ◈ Data Manager (central software component, referred to as database control system) ◈ File Manager (responsible for file structure, space management, request and transmission Mangt.) ◈ Disk Manager (Part of the OS, carries out all I/O operations) ◈ Query Manager (It interprets online query. It uses data dict. to find structure of relevant portion of

	database. It uses information to modify query. It make plan to access database for efficient data retrieval ◈ Data Dictionary (It maintains information pertaining to structure and usage of data and metadata. It is consulted by the database user to learn what each piece of data and various synonyms of data field means).

Types of Database[63]:	◈ Operational Database: They stored detailed data needed to support the operations of the entire organisation. Also know as Subject Area Data Bases (SADB). ◈ Management Database store summarised information extracted from selected operational and external database required by the manager. ◈ Info. Warehouse Database: Stores data from current and previous years. Contains data from Operational and Mngt. Database. Help to judge the progress. ◈ Distributed Database: Located at different places. Contains data from Operational and User Database. Facilitate accessing the data from any location. They should be updated consistently. ◈ End-user Database: Contains various data files developed and exclusively used by the end user (generally top management). User got their individual copy. ◈ External Database: They are privately owned online databases, access to which is available to the end-user on payment of stipulated fees... ◈ Text Database: store large text documents electronically. Data is stored using text database management system. ◈ Image Database: Image Databases are used to store multimedia, along with text.
Entity Relationship Model or Database	E-R model illustrate the interrelationship between entities in a database. E-R modelling is used to produce a type of conceptual schema of a system.
Object Oriented Database	This database, stores the data and procedures acting on the data as object. Object of similar attributes and behaviour are grouped into classes.
Client Server Database	In C-S Database, one system is connected to another system to ask question or instruct it to perform a specified job. Joined with a network of High bandwidth. C-S Architecture: 2-tier(server contain only database), and 3-tier(transfer app. Log)

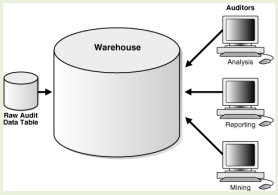
USHANT JAIN

Structured Query Language *(SQL)*[64]	A query language is a set of commands to create, update and access data from a database allowing users to raise adhoc queries/questions interactively without the help of programmers. It is a computer programming language used to manipulate information in Relational Database Management Systems (RDBMS).

Documentation and Program Library:	It provides a method to understand the various issues related with software development that include details related to system study, system development, system testing, system operational , preventive maintenance and details associated with further modification aspects of the software.
Program Library Management System Software:	PLMS is the Database of Application and System Software used by the Organisation ◈ Functional capabilities ◈ Integrity capabilities (assigned a modification number and version number.) ◈ Uses capabilities ◈ Update capabilities (it facilitates addition, deletion) ◈ Reporting capabilities (list of updation for management and auditor review) ◈ Interface capabilities (may interface with the Operating System)
User Interface Design elements:	Needs: It is about the ways in which the user will interact with the system. ◈ Source documents ◈ Query languages ◈ Hard copy ◈ Graphic display ◈ Screen layout ◈ Voice output

	◈ Inquiry screen ◈ Command languages ◈ Screen layout ◈ Icons.

Backups and Recovery:	Utility program used to make a copy of the contents of database files and log files. Recovery is a sequence of tasks performed to restore a database to some point-in-time.
Types of log:	◈ Transaction Log[36]: records database modification, use to apply any changes made between the most recent checkpoint and system failure. ◈ Mirror Log: copy of transaction log, provides additional protection.
Types of Backup:	◈ Online backup: take back up while the database is being actively accessed ◈ Offline backup: backup when the database is shutdown. ◈ Live backup: is taken using backup utility, log can be used on sec. Machine. ◈ Full and Incremental backup: backup utility copies the database and log for a full backup. In Incremental backup, backup utility copy the transaction log file since the most recent full backup.

Database warehouse	Data warehouse is a database that collects data with the aim of producing accurate and timely management information and supporting data analysis.
Development stages of Data Warehouse:	◈ Offline operational databases: here database of an operational system is copied to an off-line server thus offloading reporting needs. ◈ Offline data warehouse: data warehouse in this stage, were updated on a regular time cycle (daily, weekly, monthly), then data are stored in a integrated reporting-oriented data structure. ◈ Real time data warehouse: are updated on a transaction or event basis. ◈ Integrated data warehouse: are used to generate activity that is passed back into the operational system. Used in the daily activity of the Org.
Component of Data Warehouse: 	◈ Data Sources: it refers to any electronic repository of information that contains data of interest for management use or analytics. ◈ Data Transformation: converting data into quality data. ◈ Data Warehouse: It is a relational data base organised to hold information in a structure that supports best for reporting and analysis. ◈ Reporting: Business intelligence tools, data mining tools perform reporting. ◈ Metadata: data containing information of other data (data of data). ◈ Operations: process of loading, manipulating and extracting data from the data warehouse. Optional Component of Data Warehouse:- 1. Dependent Data Marts: Provide sub-set of the data warehouse data for a specific purpose, and exist as a separate hardware platform. 2. Logical Data Marts: It is filtered view of main data warehouse but does not physically exist as a separate data copy. 3. Operational Data Store is a combined database of short term operational data. OCD may be containing 2 months data, where data warehouse contain about one year data.

Data Mining:	Analysis of data and picking out relevant information from database. Also responsible for finding the patterns by identifying the underlying rules and features in the data.

USHANT JAIN

Development Stages of Data Mining:	1. Selection: Involve segmenting data based on specified criteria. 2. Pre-processing: Involve data cleansing, Data reconfiguration. 3. Transformation: The data is made useable and navigable. 4. Data Mining: concerned with the extraction of patterns from the data. 5. Interpretation and evaluation: The patterns identified by the system are interpreted into knowledge which can then be used to support human decision-making. (eg:- Demand of which flavour ice-cream is high).
Component of Database Environment	1. Database File: contains elements stored in database file org. Format. 2. DBMS is a set of software that organizes stores, retrieves & maintains data. 3. User: include traditional end-user and applications programmers. 4. Host Language Interface System (HLIS): DBMS interact with the computer OS and the HLIS interprets instruction in High-Level Language program to retrieve data. 5. Application Program: The application programs developed by the professional programmers are independent of the data file and use standard data definition. 6. Natural Language Interface System: Query Languages (like SQL) permits online updates and inquiry by users. It consists of simple command in English. 7. Data Dictionary/ Directory: It is component of DBMS which contains the names of data elements & information about them. 8. Online Access and Update Terminal: Dumb, smart or Intelligent Terminal can be used to update the data. 9. Output System: (report generator) They allow user to design the output reports without writing programs in a Programming Language.

USHANT JAIN

FUN PAGE: Bill Gates	
William Henry "Bill" Gates III (born October 28, 1955) is an American business magnate, investor, philanthropist, author, and former CEO and current chairman of Microsoft, the software company he founded with Paul Allen. He is consistently ranked among the world's wealthiest people and was the wealthiest overall from 1995 to 2009, excluding 2008, when he was ranked third. Bill Gates earns US$250 every second, that's about US$20 Million a DAY and US$7.8 Billion a year. The US national debt is about 5.62 trillion, if Bill Gates were to pay the debt by himself; he will finish it in less than 10 years. He can donate US$15 to everyone on earth but still be left with US $5 Million for his pocket money. If Microsoft Windows' users can claim US$1 for every time their computers hang because of Microsoft Windows, Bill Gates will be bankrupt in 3 days! Bill Gates is 54 this year. If we assume that he will live for another 35 years, he has to spend US$ 6.78 Million per day to finish all his money before he can go to heaven or hell.	 *(28-10-1955)*

3. COMPUTER NETWORKS AND NETWORK SECURITY

Definition of Computer Network:	Collection of computer and peripheral devices connected by communication links that allow the network components to work together.
Need for Network:	◈ File sharing ◈ Print sharing ◈ E-mail ◈ Fax sharing ◈ Remote Access ◈ Shared databases ◈ Fault tolerance ◈ Internet access and security ◈ Communication and collaboration ◈ Organization
Benefits of using network:	◈ Improve communication ◈ Reduce costs ◈ Improve efficiency ◈ Reduce errors

Classification of Network		
Function Based:	◈ Data Network ◈ Voice Network ◈ Multimedia Network	
Area Coverage Based[59]:	LAN *(Local Area Network)*	Physically link two or more computers within a small area is known as LAN. A high speed data transfer network that supports 1 MBPS to 30 Mbps or more.
	Wireless LAN (WLAN)	Wireless Network don no require and physical media or cables for data transmission. (use Radio Freq. Tech.)
	MAN *(Metropolitan Area Network)*	Collection of LAN based on Fiber Optic transmission technology that supports 10 Mbps transferring of data between sites. They are between LAN & WAN.
	WAN *(Wide Area Network)*	Digital communication system that cover Large geographical Area, which is controlled by public authority (Govt.), use telephone services and satellite for transmission and may also enable LAN's to communicate with each other. It operates at lower link speeds of about 1 Mbps.
	VPN (Virtual Private Network)	Is a private network that uses public network to connect remote sites or users together. Two types: 1. Remote Access: used by Company that has employee who need to connect to private network from various remote Location (User-to-LAN). 2. Site-to-Site VPN: For use of dedicated equipment, a company can connect multiple fixed sites over a public network.
	Client/Server Technology	It is a networking design in which one central computer (called as Server) serves the storage needs and sometimes the processing needs of all the network nodes (called as Client).
	Network Models: The way individual computer interact with other computers on Network	◈ Client Server: System with no or limited independence (called client) are linked to central computer called the Server. ◈ Peer-to-peer: (Connection of computer with computer). Independent stand-alone systems are interconnected.
Forwarding Based:	◈ Switch Network ◈ Shared Network ◈ Hybrid Network	
Ownership Based:	◈ Public Network ◈ Private Network ◈ Virtual Private Network ◈ Leased Network.	
Media Based:	◈ Wired Network ◈ Wireless Network.	

HANI JAIN

Components of Network	
Sender / Receiver:	A host computer at both ends which send and receive the data.
Types of Communication Interface Devices:	1) Network Interface Cards (NIC): Adapter that lets user to connect network cable with computer. 2) Modem: encoding/decoding device used to convert Digital signal from computer to Analog telephone signals and vice versa. 3) Multiplexer (MUX): Device that combines large number of low speed transmission lines into high speed lines. 4) Front-end Communication Processor: that interface communication equipment with I/O BUS or memory of data processing computer. 5) Protocol Converter: Set of rules that govern interaction between communicants. 6) Hubs: Hardware that provides common wiring point to LAN. 7) Switches: Create temporary point-to-point links between two nodes on a network. 8) Repeaters: Device which regenerates a digital signal on a LAN, thus extending the area that a LAN can cover. 9) Bridges: Devices that links two/ more LAN's, which may be dissimilar at physical layer but run same Link Layer Protocols. 10) Routers: Device which route data between several attached inputs and output. 11) Gateways: Link network(s) and computer, which use different protocols/ characteristics which prevent normal connection via bridge. 12) Remote Access Device: Modem bank that serve as gateways to Internet or to private corporate networks.
Communication Channel:	◈ Guided Media (Twisted Pair cable, Coaxial cable and Optical Fiber cable) ◈ Unguided Media (Wireless transmission).
Communication Software Functions:	◈ Access control ◈ Network management ◈ Data and file transmission ◈ Error detection and control, ◈ Data security.

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Network Topology (Structure)[61]

Geometrical arrangement of computer resources, remote devices, and communication facilities to share the information. The four *types* of network topology Structure are:-

a) Star Topology: Communication channel controlled by Centralized System. Each terminal can communicate only with Central Server. Star Shape Structure.
b) Bus Topology: Single network cable connected with node via communication line with two end points.
c) Ring Topology: Decentralized network structure in which numbers of nodes (computer) is arranged around a closed loop cables.
d) Mesh Topology: Random connection of nodes using communication links. It may be fully connected or connected with only partial links.

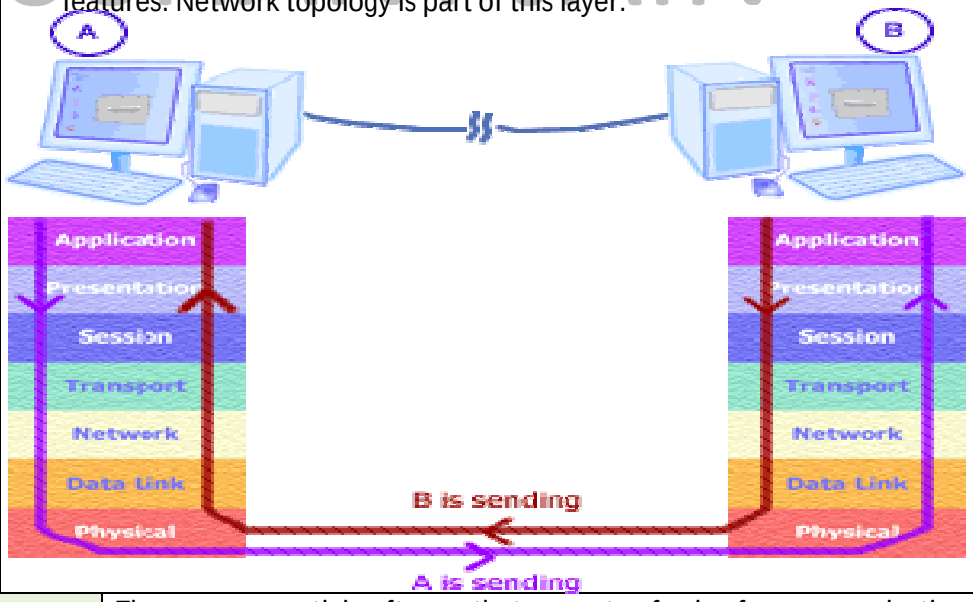
Data Transmission Techniques[60,61]:

Transferring of data on a communication channel between sender and receiver determines by transmission techniques which include direction of exchanges of data, no. of bits sent and synchronization between the transmitter and receiver. Types of transmission are:-

- Serial Vs. Parallel: Single path of data transmission serially versus multiple path of data transmission simultaneously.
- Synchronous Vs. Asynchronous: Data transmission based on regular versus irregular time interval.

Transmission Modes:	1. Simplex: It can either send or receives data, but it cannot do both. Eg T.V 2. Half-duplex: Data can be transmitted back and forth between two stations, but only in one direction at time. Eg. Walky-Talky. 3. Full-duplex: Communication channel is used in both directions at the same

	time. Eg. Telephone, Mobile, Video Calling.
Transmission Techniques:	✓ Circuit switching: Dedicated communication path between two stations. That path is a connected sequence of links between nodes. ✓ Message switching: Uses computer techniques to transmit and receive, and store and retrieve textual information. A dedicated path is not necessary. ✓ Packet switching: Communication between computers in a network in which blocks of messages to be transmitted are formed into packets and then placed on the channel. Under this mode, the date is divided into blocks called 'packet'.

Transmission Protocols:	Protocols are set of rules for communication between computers ensuring timings, sequencing, and error checking for data transmission.
Protocol Definition:	◈ Syntax: They govern the structure of commands, statements or Instruction. ◈ Semantics: This refers to the type and order of message used for error free information transfer. ◈ Timing: This defines rate selection and timing of data transfer.
Open System Interconnection (OSI) Facilitate communication of heterogeneous hardware or software platforms with each other.	1) Application Layer: Provides user services by file transfer, file sharing, etc. 2) Presentation Layer: Controls on screen display of data, provide interface. 3) Session Layer: Establish, maintain and terminates sessions. 4) Transport Layer: Ensures reliable transfer of data between user processes. Multiplexing and encryption are undertaken at this layer level. 5) Network Layer: Select Physical route & ensures proper routing of data. 6) Data link Layer: Specifies channel access control method and ensures reliable transfer of data. 7) Physical Layer: Specifies mechanical features as well as electromagnetic features. Network topology is part of this layer. 
Network Protocols (Protocols means Rules)	These are essential software that are sets of rules for communicating, timing sequencing, formatting and error checking for data transmission Location: built in software which resides either in computer's memory or memory of transmission device.
Transmission Control Protocol / Internet Protocol (TCP/IP):	TCP: Deals with the exchange of sequential data. IP: Handles packet forwarding and is used on the internet.

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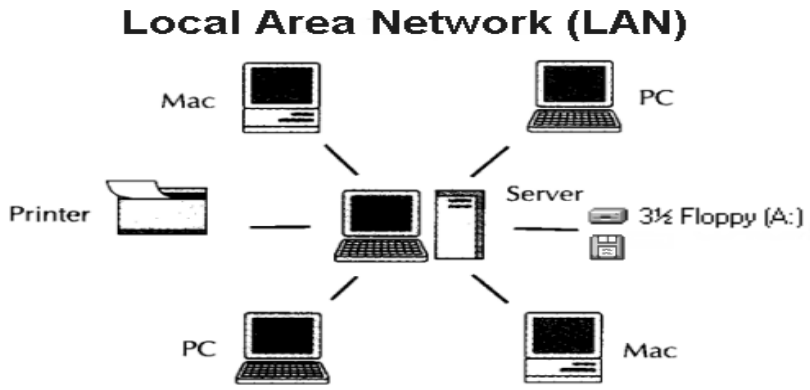
Broadband Networks-ISDN	Integrated services Digital Network is a circuit-switched telephone network system, designed to allow transmission of voice and data over ordinary telephone copper wires, resulting in better quality & Speed.

Local Area Network (LAN):	A data transmission system intended to link computers and associated devices with in a restricted geographical area. It is useful for sharing resources like files, printers or other applications. 
Benefits from LAN:	◈ Security ◈ Inexpensive workstation ◈ Distributed processing ◈ E-mailing and message broadcasting ◈ Organizational benefits ◈ Data management benefits, ◈ Software cost and up-gradation
Components of LAN:	1. File server: used to manage file system & handle network communication. 2. Network operating system: System software of LAN that integrate network hardware component. 3. Workstations: It is desktop computer with LAN card, serves as SERVER. 4. Network Interface Card (NIC): Adapter which lets user to connect network cable with computer. 5. Network cabling: Cable/wire use for transmission of data.

SUSHANT JAIN

Client/Server Technology:	A computing technology in which the hardware and software components are distributed across a network to accept the request sent by the client machine to the server machine for processing of data.
Limitation of the Traditional Computing Models:	Mainframe Architecture: All intelligence is within Central Host Computer i.e Processor Personal Computers: Stand alone computing model, no sharing of data, resources, etc. File sharing Architecture: The data sent by the server is processed into information by the workstation. GUI appended to this model adds to the network traffic. Not suitable for Multiuser application.
Component of C/S technology:	• Client: Personal computer who are user of service provided by Server. • Server: System that provide required data to Client. • Middleware: Network System implemented with C/S Server Tech. (4 Layers) • Fat-client: Processing takes place on the Client • Fat-server: places more emphasis on the server. • Network Hardware: Refer to cabling, communication cords and devices that link the server and Clients.

Basic Rate Interface (BRI):	BRI consists of two 64 Kbps B channels and one 16 Kbps D channel suitable for individual users.

Primary Rate Interface (PRI)	PRI consists of 23 B channels and one 64 Kbps D channel for users with higher capacity requirements.

Types of Servers:	◈ Database Servers: It allows the user interface software to run on each user's PC (client). Database engine became bottleneck when large numbers of request are pending. ◈ Application Servers: Server program that resides in server and provides business logic for application program. ◈ Print Servers: Computer or device to which one or more printer is connected, which can accept print jobs from external client computers. ◈ Transaction Servers: It is a software component that is used in implementing transaction and is parts of the system that is available in the background.
Types of Internet Server:	◈ File Server ◈ Web Server ◈ Chat Server ◈ Mail Server ◈ FTP Server ◈ Caching Server (stores frequent pages) ◈ Gopher Server ◈ News Server ◈ Proxy Server (to restrict access)

Network Tier Architecture:	A tier is a distinct part of hardware or software. It comprises:
Single tier system:	Single computer that contains a database and a front end to access the database.
2- tier system:	Client at front-end and server at back-end.
3- tier system:	Provides process management with business logic and rules.
N-tier system:	An application is executed by more than one distinct software agent.

Data Centre:	Centralized repository for the storage, management and dissemination of data and information with high security, fault-resistant facilities, hosting customer equipment that connects to telecommunication networks. Two *types* of data centres are: (1) Private and (2) Public Data Centre.
Tiers of Data Centres	1. Tier 1 & Tier 2 data centre can tolerate upto 28.8 hours of downtime per year. Do not require redundant power and cooling infrastructure. 2. Tier 3 & Tier 4 data centre can tolerate upto 0.4 hours of downtime per year. Require redundant power and cooling with multiple distribution paths.
Value added services by Data Centre:	◈ Database monitoring ◈ Intrusion detection system ◈ Web monitoring ◈ Storage on demand. ◈ Backup and restore
Features of Data Centres:	a) Size: Hundred to several thousand servers. b) Data Security: Built and arranged to withstand fire, power failure, etc. Recovery sites are also maintained. c) Availability of Data: Maximize availability of data and minimize potential

USHANT JAIN

	downtime. d) Electrical and Power Systems: Stable power and electricity facility. Uninterrupted Power System should support data centres. e) Security: Physical security ensured through guards, proximity cards, etc. Use of firewall, anti-virus and access control.
Management challenges in Data Centre:	◈ Maintain skill staff and high infrastructure ◈ Maximization uptime and performance ◈ Technology selection ◈ Resource balancing.
Disaster Recovery Sites:	1) Cold Site: In this alternative, equipment and resources must be installed to duplicate the critical business function of an organisation, do not offer real-time Sync. No other resources or equipment except A.C. 2) Warm Site: Partially equipped, as compared to Hot site. Have essential resources to start the critical functions. 3) Hot Site: They are fully equipped with resources to recover business functions that are affected by a disaster.
Business Continuity Planning (BCP):	A BCP is a logistical plan for how an organization will recover and restore partially or completely interrupted critical functions within a predetermined time after a disaster or extended disruption.
	Life Cycle of BCP: Analysis→Solution design→Implementation Testing and organization acceptance→Maintenance.

Network Security:	Ensure safeguarding of assets and maintain the data integrity within the system.
Need of Security:	Safeguard assets, ensure and maintain the data integrity.
Level of Security:	◈ Prepare project plan ◈ Assets identification ◈ Assets valuation ◈ Threats identification ◈ Threats probability of occurrence assessment ◈ Exposure analysis ◈ Control adjustment ◈ Report generation
IDS (Intrusion Detection System)	Means: An Intrusion Detection System generally detects unwanted manipulation to computer systems, mainly through the Internet.
	1. Network Intrusion Detection: monitor packets on an entire subnet. 2. Host-based Intrusion Detection: concerned with what occurs on the hosts themselves. 3. Hybrid Intrusion Detection: Combination of NID and HID 4. Network-Node Intrusion Detection: Monitor packets addressed to the specific host on which it resides.
Threats and Vulnerabilities:	◈ Fire ◈ Water ◈ Energy variations ◈ Pollution ◈ Intrusion ◈ Viruses and Worms[68] ◈ Misuse of software ◈ Hackers.
Techniques of Network security:	Firewall.

SUSHANT JAIN

FUN PAGE: Mark Zuckerberg	
Mark Elliot Zuckerberg is an American computer programmer and Internet entrepreneur. He is best known for co-creating the social networking site Facebook, of which he is chief executive and president. It was co-founded as a private company in 2004 by Zuckerberg and classmates Dustin Moskovitz, Eduardo Saverin and Chris Hughes while they were students at Harvard University. In 2010, Zuckerberg was named Time magazine's Person of the Year. As of 2011, his personal wealth was estimated to be $17.5 billion. 'Princely', 'Slayer' and 'Zuck'. These all are the various nicknames by which Mark Zuckerberg is often called by. Mark Zuckerberg also has a successful Hollywood film, 'The Social Network' dedicated to him which maps the birth and rise of Facebook. Mark says Money and fame isn't important for him. Mark Zuckerberg rejected a $1 billion offer to buy Facebook.	*(14-5-1984)*

SUSHANT JAIN

4. INTERNET AND OTHER TECHNOLOGY

History of Internet:	Advanced Research Project Agency (ARPA) of Department of Defence, U.S. developed a network named ARPANET in 1970 to share information between networks.
What is Internet?[62]	A network of computers that offers communication & access to information through e-mail, bulletin boards, chatting, and information retrieval services that can access files, directories and database around the world.
World Wide Web (WWW):	A network of computers which communicates with each other using standard is called HTTP (Hyper Text Transfer Protocol), A protocol which provides access to large amount of information located on many different servers. Web Page and Web Browser are elements of WWW.
Uniform Resource Locators (URL):	A Text string used to address and access individual web pages and Internet resources. It contains protocol name, domain name and hierarchical description of file location. Eg. www.facebook.com
Internet Surfing:	Hopping from one computer to another using www links on the internet is called Interned Surfing.
Domain Name	It is the unique name that identifies an Internet Site. Always have 2 or more parts, which are separated by dot. Eg. Mail.yahoo.in
Applications of Internet:	◈ Communication ◈ Data retrieval ◈ Data publishing
Business use of Internet:	◈ Reach a worldwide audience ◈ Provide product information ◈ Save costs ◈ Replace phone banks ◈ Provide easy access to customer ◈ Reduce the burden of customer service ◈ Create corporate image ◈ Recruitment and staffing services ◈ Provide useful services ◈ Online services ◈ Eliminate the middle man ◈ Online E-commerce etc.
Types of Internet Connections:	◈ Analog/Dial-up Connection ◈ ISDN Connection ◈ B-ISDN Connection ◈ DSL Connection ◈ ADSL Connection ◈ SDSL Connection ◈ VDSL Connection ◈ Cable Connection ◈ T-1 Lines Connection ◈ Bonded T-1 Connection ◈ T-3 Lines Connection ◈ Satellite Connection

Components of Internet:				
Electronic Mail (E-mail):	A technique in which messages or documents is sent to another person using Internet.			
	Advantages:	◈ Easy ◈ Fast	◈ Inexpensive ◈ Easy to Filter	◈ Secure and Reliable.
	Features:	◈ Composing ◈ Replying ◈ Address book	◈ Printing ◈ Editing ◈ Forwarding	◈ Transfer of data files ◈ Greeting cards
Web Casting or Push Technology:	Allows users to passively receive broadcast information rather than actively search the web for information. For example, Internet news service.			

Intranet[62]	An information system that facilitates communication within the organization, among widely dispersed departments, divisions, and regional locations. This is private version of Internet. Use Public network to send messages.

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Benefits of Intranet	◈ Workforce productivity ◈ Time ◈ Communication ◈ Web publishing ◈ Business Operations and Management ◈ Cost-effective ◈ Promote Common corporate culture ◈ Enhance collaboration ◈ Cross-platform capability

Extranet	An extension of an Intranet which is accessible to outside companies or individuals with or without an Intranet. It is a collaborative Internet connection with other companies and business partners.
Benefits of Extranet	◈ Exchange large volumes of data ◈ Share product catalogs ◈ Collaborate with other companies ◈ Develop and use training programs ◈ Access services by one company ◈ Share news of common interest.

Internet Protocol Suite:	A set of communication protocol that implements the protocol stack on which the Internet and most commercial networks run. Layers of TCP/IP are Application Layer, Transport Layer, Network Layer, and Link Layer.

E-Commerce:	A process of doing business electronically which involves the automation of a variety of business-to-business and business-to-consumer transactions through reliable and secure connection.
Working of E-Commerce:	1. Order Placed 2. Authorization Request 3. Authorization Response 4. Order Fulfilled 5. Settlement Request 6. Settlement Deposited.
Internet's dramatic impact on the scope of business networking applications:	◈ Universality ◈ Reach ◈ Performance ◈ Reliability ◈ Cost ◈ Momentum

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Types of E-commerce:	
Business-to-Business (B2B):	Exchange of services, information and/or products from one business to another that takes the form of automated processes between trading partners.
Business-to-Consumer (B2C):	Exchange of services, information and/or products from a business to consumer, as opposed to between one business and another. Two types of B2C e-Commerce are Direct Seller and Online Intermediaries.
Consumer-to-Business (C2B):	Exchange of services with business vendors by posting their project work with set budget online. The consumer reviews all the bids and selects the company for further processing.
Consumer-to-Consumer (C2C):	An Internet-facilitated form of commerce between consumer of the product.

CRM: Customer Relationship Management	The methodologies, technology and capabilities that help an enterprise to manage customer relationship in a better way through the introduction of reliable systems, processes and procedures. Three types of application architecture of CRM are-
Operational CRM:	◈ Sales force automation (SFA) ◈ Customer service and support (CSS), ◈ Enterprise marketing automation (EMA)

Analytical CRM:	Analysis of data to segment customers or to identify potential to enhance client relationship. Types of operations are Acquisition, Retention, Information, and Modification.
Collaborative CRM:	Benefits are Efficient productive customer interactions, Web collaboration to reduce service cost, Enabling multi-channel personal customer interaction, Interaction at the transaction level.
Functions of CRM:	◈ Scalability ◈ Multiple communication channels ◈ Workflow ◈ Assignment, ◈ Database ◈ Customer privacy considerations

Supply Chain Management (SCM):	A process of planning, implementing, and controlling the operations of the supply chain with the purpose to satisfy customer requirements as efficiently as possible.
Potential Growth area of SCM:	◈ Fulfilment ◈ Logistics ◈ Production ◈ Revenue & Profit ◈ Costs ◈ Co-operation.
Problems in SCM:	◈ Distribution Network Configuration ◈ Distribution Strategy ◈ Information ◈ Inventory Management
SCM Activities:	◈ Strategic ◈ Tactical ◈ Operational
The Bullwhip Effect:	Observed phenomenon in forecast-driven distribution channels. Forecasts are based on statistics and are rarely perfectly accurate.

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Electronic Data Interchange (EDI):	Electronic exchange of business documents in a standard and universally accepted format between trading partners which includes invoices, purchase orders, and shipping notices in a standard, machine process able data format.
Advantages of EDI:	◈ Issue and receive orders faster ◈ Make sales more easily ◈ Get paid sooner ◈ Minimize capital tied up in inventory ◈ Reduce letters and memos ◈ Decrease enquiries ◈ Make bulk updates of catalogues and parts listings
EDI process:	Translation of data into standard format→ Transmission over communication lines→ Re-transmission of data

EFT (Electronic Fund Transfer)	Stands for Electronic Fund Transfer that represents the way the business can receive direct deposit of all payments from the financial institution to the company's bank account. EFT can be performed using 4 methods. They are: Automated Teller Machines (ATMs), Point-of-Sale (POS) Transaction, Preauthorized Transfers, Telephone Transfers.
Types of E-payment:	◈ Credit Cards ◈ Transaction using third party verification ◈ Secured Electronic Transaction (SET) ◈ Joint Electronic Transaction ◈ Electronic Cheques ◈ Smart Cards ◈ Electronic purses.

Risk and Security Consideration:	◈ Reliability ◈ Scalability ◈ Ease of use ◈ Payment methods
General Management	◈ Loss of paper audit trail ◈ Business continuity ◈ Potential legal liability, record retention and retrievability

Concern:	◈ Exposure of data to third parties	◈ Segregation of duties
Information and Systems Security Tools:	◈ Firewalls[62] ◈ Encryption[62]	◈ Message authentication ◈ Site blocking.

Mobile Commerce:	Buying and selling of goods and services through wireless handheld devices such as Cellular Telephone and Personal Digital Assistants (PDAs) known as next generation e-commerce. M-commerce enables users to access the Internet without need to find a place to plug in which is based on technology called Wireless Application Protocol (WAP).

Bluetooth: *[Logo: Bluetooth]*	Telecommunication Industry specification that describes how mobile phones, computers, and Personal Digital Assistants (PDAs) can be easily interconnected using a short-range wireless connection. A data can be exchanged at a rate of 1 Mbps to 2 Mbps.

Wireless Fidelity [Wi-Fi]: *[Logo: Wi-Fi]*	A technology of Wireless Local Area Network (WLAN) based on IEEE 802.11 specifications to be used for mobile computing devices, such as laptops, in LANs, in Internet, VOIP, gaming and basic connectivity of consumer electronics such as televisions and DVD Players.

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FUN PAGE: Google	
Google is a mathematical term 1 followed by one hundred zeroes. The term was coined by Milton Sirotta, nephew of American mathematician Edward Kasne. Google started in January, 1996 as a research project at Stanford University, by Ph.D. candidates Larry Page and Sergey Brin when they were 24 years old and 23 years old respectively. Google receives daily search requests from all over the world, including Antarctica. The infamous "I'm feeling lucky" button is nearly never used. However, in trials it was found that removing it would somehow reduce the Google experience. Users wanted it kept. It was a comfort button. Due to the sparseness of the homepage, in early user tests they noted people just sitting looking at the screen. After a minute of nothingness, the tester intervened and asked 'Whats up?' to which they replied "We are waiting for the rest of it". To solve that particular problem the Google Copyright message was inserted to act as a crude end of page marker. Google has the largest network of translators in the world. Employees are encouraged to use 20% of their time working on their own projects. Google News & Google+ are both examples of projects that grew from this working model.	*[Logo: Google (1998)]* *[Logo: Google (2011)]* *Founded on: 4-9-1998* *Founders: Sergey Brin& Larry Page*

5. INTRODUCTION OF FLOWCHART[66]

Process of Programming:	Set of instructions used in processing of data performed by the computer is called program. The various phases of Computer Programming are-	
Program analysis:	Determines the Input, Output and Processing of data.	
	Algorithm:	An effective method for solving a problem expressed as a finite sequence of instructions.
Program designing:	Determines the function to be performed using flow chart and file layout.	
Program coding:	Conversion of logic of the program outlined in the flowchart which describes program statement or instruction by using rules concerning format and syntax.	
Program debugging:	A process of finding errors in program and ratifying them using diagnostic routine.	
Program documentation:	Includes Program specification, Program descriptions, Test data, Operational manual and finally, Maintenance documentation.	
Program maintenance:	Modification, Re-writing and restructuring of program, based on requirements of business data processing application subjected to the continued changes in near future.	

Flow Chart:	A diagram that shows sequence of steps to solve a particular problem. It is a logical flow of step which shows sequence of operations of a program by using symbols and interconnecting lines.	
Types:	1. System outlines chart 2. System flowchart	3. Run flow chart 4. Program flowchart
Benefits:	◈ Quicker grasp of relationships ◈ Effective analysis ◈ Communication ◈ Documentation	◈ Efficient coding ◈ Orderly check out of problem ◈ Efficient program maintenance.
Limitations:	◈ Complex logic ◈ Modification ◈ Reproduction	◈ Link between conditions and actions ◈ Standardization ◈ Loss of technical details
	◈ Lack of transformation between one level of design to another level of design	

Program Flowchart:	Concerned with logical/arithmetic operations on data within CPU and the flow of data between the CPU and Input/output peripherals.		
Arithmetical and logical operation:	◈ Addition ◈ Subtraction ◈ Multiplication	◈ Division ◈ Transfer ◈ Comparison	◈ Printing ◈ Feed

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Start/end	
Instruction flow line	OR
Input/output	
Process	
Decision	
On-page connector	
Off-page connector	
Print	
Display	
Online storage/floppy disc	
Magnetic tape / sequential access storage	

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FUN PAGE: Wikipedia	
Wikipedia was launched in January 2001 by Jimmy Wales and Larry Sanger. Sanger coined the name Wikipedia, which is a portmanteau of wiki (a technology for creating collaborative websites, from the Hawaiian word wiki, meaning 'quick') and encyclopaedia. Wikipedia's official theme song is "Hotel Wikipedia". The Eagles' 1976 hit Hotel California has been co-opted as the official theme song for Wikipedia, from a list of a number of songs described as W.O.R, or "Wikipedia-oriented rock". The least popular, but still active, alternate-language Wikipedia is Cheyenne. Wikipedia has had more than 1 billion edits, across 17.6 million articles, from 27 million users.	*[Logo: Wikipedia]* Launched on: *15-1-2001* Founded by: Jimmy Wales Larry Sanger

6. DECISION TABLE

Decision Table:	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.	
Four parts of Decision Table:	◈ Condition stub ◈ Action stub ◈ Condition entries ◈ Action entries	
	Condition being tested	*Condition statements* / *Condition entries*
	Possible action to take	*Action statements* / *Action entries*
Steps to create a Decision Table	1. List all causes in the decision table 2. Calculate the number of possible combinations 3. Fill Columns with all possible combinations 4. Reduce test combinations 5. Check covered combinations 6. Add effects to the table.	
Types of Decision Table	Limited Entry Tables:	The condition and action statements are complete. The condition and action entries merely define whether or not a condition exists or an action should be taken. Y : Condition exists N : Condition does not exist – : Condition/Action does not apply X : Execute the action statement
	Extended Entry Table:	Condition and action statements are not complete, but are completed by the condition and action entries. Condition and action entries not necessarily be defined as Y, W and X.
	Mixed Entry Table:	It combines both the limited and extended entry forms.

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7. Differences in Information Technology

1. Data Vs. Information.

No.	Distinction	Data	Information
1.	Meaning	It is the smallest raw fact of life. It is the plural form of the word datum.	It is the processed data.
2.	Input/Output	It is the input for processing.	It is the output of processing.
3.	Usefulness to the user.	It is not directly useful to the user.	It is directly useful to the user because of its presentation, format and design.
4.	How is it collected?	It is generally collected in vouchers or source documents from which they are entered into computer.	It is always presented in a well designed format, either on paper or on computer terminal.
5.	From where it is collected?	Data used for a single application is collected from several departments.	Information in the form of report is distributed to more than one department or business function.
6.	Volume	Data for business applications is generally voluminous.	Information is the way of summarizing data so that it has some use and value to the user. Summarization brings down the volume of information.
7.	Nature	Data should be accurate but need not be relevant, timely or concise.	Information must be relevant, accurate, timely, concise and complete and apply to the current situation.

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2. Analog Vs. Digital Computer.

No.	Analog Computer	Digital Computer
1.	Analog computers represent numbers by a physical quantity i.e. they assign numbers by physically measuring some physical property such as voltage, temperature, etc.	Digital computers represent data as numbers. Counting on fingers is the simplest form of digital computers.
2.	Analog computers process analog signals which are continuous in nature.	Digital computers process digital signals which are in discrete form.
3.	These Computers are not accurate and have limited storage capacity.	These computers are highly accurate upto several decimal places.
4.	These are very much suitable for scientific and engineering applications.	These are very much suitable for business data applications.
5.	They are cheap and easy to program.	They are costly and complex to program.
6.	Programming is easy and cheap.	Programming is complex and costly.

7.	Storage capacity is limited.	Can store huge volume of data.
8.	Single purpose.	Multi purpose.

3. Bit Vs. Byte

No.	BIT	BYTE
1.	It is the smallest unit of storage measurement.	It is a collection of 8 bits.
2.	A bit can represent either '0' or '1'.	It can represent an alphabet, number or some special symbol.
3.	It is represented in the form of ON or OFF in the memory.	It is used to represent several combinations of bits that indicate a character.
4.	It is used to represent small amount of memory.	It is used to represent large amount of memory.

4. Data Processing Vs. Data Processing System.

No.	Data Processing	Data Processing System
1.	Data Processing is the restructuring, manipulating or recording of data by people or machines to increase their usefulness and value for some particular purpose.	Data Processing System is a system that accepts data as input, processes it into information and gives output.
2.	It refers to some operations, which are required to process data and to produce information. For example, classifying, sorting, summarizing etc.	It refers to some system which performs those functions.
3.	Processing involves some steps but does not include any components	The components in manual data processing system would be men. They will use simple tools such as paper, pencils and filing cabinets. Mechanical data processing systems utilise such mechanical devices as typewriters, calculating machines and book keeping machines. Automatic data processing implies the use of machines for data processing. It could be performed either by unit record method or electro mechanically by computer.
4.	The main objective of data processing is to increase the usefulness the data.	The system is designed to achieve the objectives of data processing.

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5. Different Generations of Computers.

Particulars	First	Second	Third	Fourth	Fifth
Year	1949-55	1956-65	1966-75	1976-95	1996 onwards
Size	Room Size	Cupboard Size	Desk Size Minicomputer	Typewriter Sized Computers &	Credit Card Sized Computers &

				Laptops	Palmtops
Density	One Component per Circuit	100 Components per Circuit	1000 Components per Circuit	Hundreds of Thousands of Components per Circuit	Millions of Components per Circuit
Technology	Vacuum Tubes	Transistors	Integrated Semiconductor Circuits	Large Scale Integrated Semiconductor Circuits	Very Large Scale Integrated Semiconductor Circuits
Main Memory	Magnetic Drum	Magnetic Core	Magnetic Core	LSI Semiconductor Circuits	VLSI Superconductor circuits
Secondary Storage	Magnetic Drum Magnetic Tape	Magnetic Tape, Magnetic Disk	Magnetic Disk, Magnetic Tape	Magnetic Disk, Floppy Disk, Magnetic, Bubble, Optical.	Optical Disks & Magnetic Disks
Memory	10K - 20K Characters	4K - 64K Characters	32K – 4000K Characters	51K – 32000K Characters	Billions of Characters
Operating Speed	Milli Seconds 10^{-3}	Micro Seconds 10^{-6}	Nano Seconds 10^{-9}	Pico Seconds 10^{-12}	Still less than Pico seconds. 10^{-15}
External Speed	Few thousand Instructions	Upto 10 Lakh Instructions	Upto 1 Crore Instructions	100 mps	Billion Instructions /sec.
Input/output devices	Punched card, paper tape	Paper tape, Magnetic tape, VDU	VDU, MICR, OCR	VDU, MICR, OCR, Voice Recognition	Speech Input, Tactile Input, Graphics, Voice Responses
Cost	Very High	Lower than First Generation	Lower than Second Generation	Lower than Third Generation	Very Low
Other features	Generate heat, Relatively slow & rigid in operations.	Reliable & Accurate, fast	Faster, reliable, time sharing & Multi Processing Made possible	Sophistication & Complex usage, Improved storage	Sophistication & Complex usage, improved storage
Programming Language	Machine & Assembly Level Language	High Level Language FORTRAN, COBOL.	High level Languages: FORTRAN IV, COBOL 68, PL/1,	Fourth Generation Language: FORTRAN 77, PASCAL, C, C++, JAVA.	Fifth Generation Languages
Data Processing	Serial	Spooling	Multi-Programming	Multi-Processing	Multi-Processing

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6. Master File Vs. Transaction File.

No.	Master File	Transaction File
1.	Master file contains relatively permanently records for identification and summarizing statistical information.	These are created from source documents used for recording events or transactions.

2.	It contains current or nearly current data, which is updated regularly.	These files generally contain information used for updating master files.
3.	It rarely contains detailed transaction data.	It contains detailed data.
4.	The product file, customer file and employee file are examples of master files.	Examples of transactional files are purchase orders, job cards, invoices etc.
5.	These are usually maintained on direct access storage devices.	These can be maintained on sequential as well as direct access storage devices.

7. Workstation Vs. Microcomputer.

No.	Workstation	Microcomputer
1.	Workstations are powerful desktop computers designed to meet the needs of engineers, architects and other professionals who need good graphic displays.	It is a full-fledged computer system which uses a microprocessor as its CPU.
2.	It looks like a personal computer and is used by a single user. Its CPU uses Reduced Instruction Set Computing (RISC), which results in faster processing of instructions	It uses a microprocessor as its CPU. It is also a single user computer.
3.	Workstations generally run on Unix Operating System or a variation of it.	Microcomputers run on Dos, Unix, OS/2, MS Windows NT, etc. Microcomputers enable the users to switch between tasks known as Multitasking, which is a great time saver.
4.	Workstations are commonly used for Computer-Aided Design (CAD) and are used as servers for Local Area network (LAN)	It is multi purposeful. If the required software is available, it can be used for any application.
5.	Relatively fast in processing.	Relatively slow in processing.

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8. Special purpose computers Vs. General Purpose computers.

No.	Special purpose computer	General purpose computer
1.	A special purpose computer is designed to perform a special task.	General purpose computers can be used for business, scientific and other applications.
2.	The instructions are in-built in the computer circuitry by the manufacturers.	It can be programmed by the user for different purposes.
3.	These are also called dedicated computers.	These are also called versatile machines.
4.	More efficient machines.	Less efficient than special purpose computers.
5.	Programs in the machine cannot be changed or upgraded.	As and when necessary, programs can be amended or dropped.
6.	Costly.	Comparatively cheap.

9. Third Generation Computers Vs. Fourth Generation Computers.

No.	Third Generation Computers	Fourth Generation Computers
1.	They employed integrated circuits, in which all the elements are integrated on a tiny silicon wafer.	They appeared in 1970's. They still utilised still newer electronic technology and made the computer still smaller and faster then third generation computers.
2.	Mainframes, Mini Computers are one of the developments in this generation.	Micro computers and super computers were introduced in this generation.
3.	They consume more power.	They consume less power.
4.	These are bigger in size.	These are smaller, compact in size.
5.	These are costlier.	These are low cost machines.
6.	Third generation computers are used by large organisations.	Fourth generation computers are used by small organisations or individuals.
7.	Processor's speed started to be measured in nano seconds.	Processor's speed started to be measured in pica seconds.
8.	Third generation computers offer many salient features such as better operating systems, multi programming and support of secondary storage tapes and disks.	User oriented software, concept of virtual storage which expands the main storage capacity etc. are the significant features of this generation computers.
9.	Support high level languages such as FORTRAN and COBOL.	Object oriented languages such as C++, Visual Basic, etc. were introduced.

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10. Hardware Vs. Software.

No.	*Distinction*	*Hardware (HW)*	*Software (SW)*
1.	Meaning	Refers to components that constitutes computer system.	Refers to means of controlling the computer equipment.
2.	Visibility	It refers to physical, visible components of a computer.	If refers to invisible components of a computer.
3.	Components	It is made up of input devices, output devices, C.P.U., storage devices, communication devices etc.	Software is made up of data and instructions.
4.	Producers	Hardware is produced by Hardware manufacturers. Eg. IBM, INTEL, HCL, WIPRO, HP, SONY, AMKETTEE.	System Software like WINDOWS are manufactured by big software companies like MICROSOFT. Some readymade application Software like "TALLY, Ex etc. are manufactured by Software companies like TCS, Infosys etc. Other application Software may be prepared by individual programmers and end users.
5.	Modularity	Most of the Hardware devices are purchased initially but few of them can be added later on.	Most of the Software can be purchased initially along with Hardware. But application software is procured in stages, depending on requirements.
6.	Changes/	Hardware once procured does	System Software once procured do not go

	Alteration	not go through frequent charges except for new additions or releases or updation.	through frequent changes, except for updation. Application software goes through frequent changes whenever policies and procedures are changed.
7.	Virus	Do not get affected by computer virus.	Only Software gets affected by computer virus.

11. Super computer Vs. Mainframe Computer.

No.	Super Computer	Mainframe
1.	Super computers are the largest and fastest computers available.	Mainframes are slower, less powerful and cheaper than super computers.
2.	These are used in specialised areas like defence, aircraft design, medical research etc. where huge processing speed is required.	These are used in handling all kinds of scientific and business applications.
3.	These computers can process upto 64 bits or more at a time.	Mainframes process 32 bits or less number of bits at a time.
4.	These can support upto 10,000 terminals.	These can support upto 1,000 terminals.
5.	Processes upto 1.2 billion instructions per second.	Processes upto 5 to 10 million instructions per second.
6.	These computers are very costly and are generally developed by government.	These are relatively cheaper and are owned by big companies.
7.	Not used in commercial data processing.	Useful in commercial data processing.
8.	CRAY, CDAC, Fujitsu, Thinking Machine Corporation, etc. are major suppliers.	IBM, Sun Microsystem, HP, NCR, Burroughs, etc. are major suppliers.

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12. Data Bus Vs. Address Bus.

No.	Data Bus	Address Bus (Or Memory Bus)
1.	The data bus is an electrical path that connects the CPU, memory & the other hardware devices on the motherboard.	The second bus that is found in every microcomputer is the address bus. The address bus is a set of wires similar to the data bus that connects the CPU & RAM & carries the memory addresses.
2.	Actually, the bus is a group of parallel wires. The number of wires in the bus affects the speed at which data can travel between hardware components.	The number of wires in an address bus determines the maximum number of memory addresses. For e.g. 1 byte of data is enough to represent 256 different values. If the address bus could carry only 8 bits at a time, the CPU could address only 256 bytes of RAM.
3.	It decides the data transfer speed between various peripheral devices attached to the computer.	It decides the data transfer speed between RAM and Micro Processor.

4.	It always carries data.	It always carries addresses.

13. Dynamic RAM Vs. Static RAM.

No.	Dynamic RAM	Static RAM
1.	It is the most common type of memory. It is dynamic because each memory cell quickly loses its charge. So, it must be refreshed for hundreds of times each second.	It is the rarely used type of memory. It is static because each memory cell does not lose its charge. So, it is not required to refresh the data continuously. The static RAM retains the stored data as long as power remains on.
2.	It is slow, small and less expensive.	It is faster, larger and more expensive than DRAM.
3.	Dynamic RAM is the most common type of main memory.	This is used mainly in a special area of memory called cache memory.
4.	They contain a transistor that acts as a switch and a capacitor which is capable of storing electric charge. Depending on the switching action of the transistor, the capacitor either contains no charge or does hold a charge.	It is not necessary to refresh the contents continuously.
5.	In DRAM, the computer does the refreshing process taking time out from other activities. So, processing gets slow down.	Processing will be fast because it is not necessary to refresh the data continuously.
6.	The power consumption of Dynamic RAM is less than that of Static RAM. Thus higher amount of integration is possible.	The power consumption of Static RAM is more than Dynamic RAM. Thus higher amount of integration is not possible.

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14. RAM Vs. ROM.

No.	Distinction	ROM	RAM
1.	Expansion	Read Only Memory.	Random Access Memory
2.	Changes to contents	Contents of ROM can be read and used but can't be corrected or erased.	Contents of RAM can be read, used, corrected or erased.
3.	Volatility	ROM is not volatile i.e. the contents are not lost when power is switched off.	It is volatile i.e. its contents are lost when the power is switched off.
4.	Size	Very small in size.	Very large in size.
5.	Contents	Contains important instructions which are needed to activate the system at the time of starting or	It contains data and instructions of the applications which are under process.

		Booting.	
6.	Permanence	It is a permanent storage which contains same instructions at all times.	It is a temporary storage which gets different sets of data and programmes at different times, depending on the application being processed.
7.	Who will load?	ROM instructions are loaded by the manufacturers.	RAM instructions are loaded by the user.
8.	Used by whom?	Programmers and machine use RAM.	Only machines use ROM.

15. Virtual Memory Vs. Main Memory.

Main memory is a part of the computer hardware, which stores programs and data that are in active use. Storage locations in main memory are addressed directly by the CPU's load and store instructions. Access is slower from main memory than from CPA registers because of large capacity and the fact that it is physically separated from the CPU.

Virtual memory, on the other hand, is a technique that allows the execution of a process, even though the logical address space requirement of the process is greater than the physical available main memory. The technique works by dividing a program on disk into fixed length pages or into logical, variable length segments. Virtual memory thus extends primary memory by treating disk storage as a logical extension of the main memory.

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Virtual memory helps in efficient main memory utilisation. The programs can be loaded partially in the main memory, so more programs can be run at the same time. Hence, efficient CPU utilisation and better throughput is possible by using the concept of virtual memory. Virtual memory makes the task of programming much easier, because the programmer no longer needs to worry about the amount of physical or main memory available.

Following table indicates the difference between virtual memory and main memory.

No.	Virtual Memory	Main Memory
1.	Virtual Memory does not exist in reality. Its presence can be experienced logically but not physically.	It is also known as primary memory and it exists physically.
2.	It is a technique adapted by the operating system.	It is directly addressed and controlled by CPU.
3.	With the help of this facility even large files can be operated on small amount of RAM.	This memory will decide the speed of processing. More the amount of RAM faster will be the processing.
4.	Virtual memory is a concept which depends on the software that is being used.	Main memory will exit inside the system unit and is independent of software being used.
5.	In this memory parts of programs are called segments or pages.	Here parts of programs are known as blocks.

6.	It is not expandable and its size depends on the program being used. Thus virtual memory being used by the computer, changes from time to time.	It is expandable and its size is independent of the program being used.

16. Interface Vs. Port.

Interface: A user interface, consisting of the set of dials, knobs, operating system commands, graphical display formats, and other devices provided by a computer or a program to allow the user to communicate and use the computer or program. A graphical user interface provides its user a more or less "picture-oriented" way to interact with technology.

- A programming interface, consisting of the set of statements, functions, options and other ways of expressing program instructions and data provided by a program or language for a programmer to use.
- The physical and logical arrangement supporting the attachment of any device to a connector or to another device.
- In case of hardware equipment, to interface means making an appropriate physical connection so that 2 pieces of equipment can communicate or work together effectively.

Port: On the other hand, an interface connection is called a port. A port is a socket on the back of the computer, which is used to connect external devices to the computer. When the user needs to add a new piece of hardware to the computer, he/she can plug the device into an existing port. Most computers have several types of ports, each with a different capabilities and uses. Most common types of ports available on computer these days are 25-pin serial port, 25-pin parallel port, keyboard port, 9-pin serial port and 15-pin game port. RS-232 is a de-facto serial port.

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Following table indicates the difference between virtual memory and main memory.

No.	Ports	Interfaces
1.	A connection point for interface is called port.	It is a facility which consists of tools & other components to communicate with the Computer hardware or software.
2.	It is a socket on the back of the computer & is used to connect external devices to the computer.	It is making an appropriate physical connection to make two pieces of equipment to communicate or work together.
3.	It is related to Hardware alone.	It is related to both hardware & Software.
4.	Ports are used for the transmission of data, with in a computer system and its peripherals.	Interfaces are used to translate the external data into internal codes and vice versa.

17. Main Memory Vs. Cache Memory.

Main memory of a computer is very significant because it is used to store the operating system and an ever changing parade of programs and data. Main memory is a random access memory (RAM) since access time in RAM is independent of the address of the word i.e. each storage location (address) inside the memory is as easy to reach as any other location and takes the same amount of time. In a computer system, main memory Is supported by cache memory.

Cache is a special area of high speed memory that is located between the CPU and main memory. When the processor needs data, it checks high-speed cache first to see if the data is there, If not, the processor then retrieves the data from the main memory.

Main memory generally uses dynamic RAM (DRAM) chip. It is dynamic because each memory cell quickly loses its charge, so it must be refreshed hundreds of times each second to prevent data from being lost. On the other hand, cache memory uses special chips often, static RAM (SRAM) chips. It is static because it is not required to be refreshed continuously. SRAM is faster, larger, and more expensive and consumes more power.

On some systems, cache memory is four times as fast as regular main memory. However, cache costs six times as much as main memory. On the other hand cache memory is used at 2 levels. Some amount of cache memory is loaded on the processor, known as level 1 cache. Some amount is loaded on the motherboard, known as level 2 cache.

Following table indicates the difference between main memory and cache memory.

No.	Main Memory	Cache Memory
1.	It is also known as primary memory.	It is also known as high speed buffer memory.
2.	It is directly addressed and controlled by the CPU.	It operates and exists between CPU and main memory.
3.	It is cheaper.	It is highly expensive.
4.	The operating speed low.	The operating speed is very high and it will run at the speed of CPU.
5.	It stores large segments of programmes.	It stores small segments of programmes.
6.	It can be addressed by the user.	It can not be addressed by the user.
7.	The memory transfer rate is low.	The memory transfer rate is high.
8.	Its access time is high.	Its access time is low.

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18. Cathode Ray Tube (CRT) Vs. Flat Panel Display Devices.

No.	Cathode Ray Tube (CRT) Display Monitor	Flat Panel Displays
1.	These are also known as Visual Display Units.	There are 2 popular technologies - Liquid Crystal Display (LCD) & Gas Plasma Technology.
2.	CRT devices use a large glass tube known as the CRT Tube. The screen of the tube is coated with tiny dots of phosphor material which glows when electrically charged. A gun inside the CRT Tube lights up the phosphorescent pixels on the screen surface.	LCD has special molecules called Liquid Crystals deposited between two sheets of material, which generates the image when electric current passes through them. Gas Plasma uses a layer of gas instead of Liquid Crystals in the LCD monitor, which glows when voltage is applied and produces image.
3.	Resolution is limited and poor.	Offer better resolution.
4.	Reliable but bulky in size.	These are lightweight and compact.

5.	Relatively inexpensive.	Relatively expensive.
6.	Consumes more power and not suitable for portable devices.	Consumes less power and are very much suitable for portable devices.
7.	Can't work effectively in the areas of magnetic interference.	Can work effectively even in the areas of magnetic interference.

19. Direct Data Entry Vs. Remote Data Entry.

No.	Direct Data Entry	Remote Data Entry
1.	Under this method data is entered directly into the computer using machine-readable source documents or through use of on-line terminals.	Data is entered and grouped in blocks for transmission to computer from a terminal, which is located at remote site.
2.	DDE devices have the capability of scanning source documents magnetically or optically. For e.g. MICR, OCR, OMR etc.	These terminals have capability of receiving back information from computer and printing.
3.	These terminals are connected to keyboard or other input devices for direct data entry.	These terminals are connected either directly or through communication lines with the computer.

Note: Remote job entry can also be done using Direct Data Entry devices.

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20. Dumb Terminal Vs. Intelligent Terminal.

No.	DUMB TERMINAL	INTELLIGENT TERMINAL
1.	A dumb terminal is an input / output device that provides for data entry and information exit when connected to a computer.	An intelligent terminal is an Input/Output device that is user-programmable.
2.	It has no such additional capabilities.	An intelligent terminal is user programmable. It contains not only a storage area but also a microprocessor.
3.	It is totally dependent on the computer to which it is connected.	The terminal can be programmed to communicate with and instruct the user who is entering data.
4.	Dumb terminals do not have microprocessors. Therefore, they are simple input devices that can display output from the CPU to which they are connected.	It can also do some processing of data internally such as sorting, summarizing, checking both input and computed values for reasonableness and so on. Thus it does not rely on minicomputer or mainframe computer for processing. This feature can reduce the load on the central CPU.
5.	They immediately transmit each keyed data character to the main processor. When a keying error occurs, the operator may need to backspace to the error and then re-key all	Intelligent terminals can be used on a stand-alone basis or can be part of a distributed network of terminals.

	later characters.	
6.	Cost is very low.	Cost is very high.

21. Key to Disk Vs. Key to Diskette.

No.	Key to Disk	Key to Diskette
1.	In this system data from a source document is directly keyed to a magnetic storage device.	It is a system in which data is keyed into a stand alone data station and recorded on floppy disks.
2.	The set up for a key to disk system comprises of several keying stations, a microprocessor, a magnetic storage unit and a supervisors console as a network.	It is a standalone data station and comprises of a keyboard with a visual display unit and a floppy disk drive with small memory to hold the keyed data.
3.	The data recorded in key to disk is subsequently transferred to a magnetic tape after the verification.	In this case data can be entered and verified later. The data recorded to floppy disk is later transferred to the magnetic tape.
4.	The key to disk system ensures the accuracy of input, security and monitoring of programs.	In key to diskette system the data is captured at source thereby reducing security and lack of monitoring.
5.	When there is a breakdown of mini-processor, the total network disturbs.	It works on standalone basis. If a particular data station fails, the entire network does not disturb.

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22. Smart Terminal Vs. Remote Terminal.

No.	Smart Terminal	Remote Terminals
1.	Smart Terminals are intelligent terminals that contain a microprocessor and storage facility.	They are also known as Remote Job Terminal or Remote Job Entry (RJE). They are placed in a distant location but can be accessed through telecommunication channels.
2.	They have local data editing and processing capability before transmitting to the Central Computer.	These terminals group data into blocks for transmission to a computer from a remote site. They have the capability to receive back and print the results of the application program.
3.	Smart Terminals are non-programmable by users.	These terminals are user programmable.

23. MICR VS. OCR.

No.	MICR	OCR
1.	MICR stands for Magnetic Ink Character	OCR stands for Optical Character

	Recognition.	Recognition.
2.	Magnetic ink is required for printing the characters, so that they may be interpreted for processing.	In case of OCR they can be interpreted both by human beings and by machines.
3.	MICR recognises characters, that were printed in a special type of font.	OCR recognises characters in any format.
4.	MICR is an effective method of inputting data in banking industry for encoding, decoding, sorting and keep processing of cheques.	OCR is used for automatic transcription of source documents into machine understandable format.
5.	By reading magnetic ink patterns, MICR recognises the characters and produces appropriate signals which are transmitted to computer.	Documents are passed through a light source where the matter is recognised by a photo electric device with the procedure of absorption or reflection.
6.	Under MICR, characters are printed using magnetic ink.	Under OCR, characters are not required to be printed using magnetic ink.
7.	Works on the principles of magnetism.	Works on the principles of optics i.e. light.

24. OMR VS. OCR.

No.	OMR	OCR
1.	OMR stands for Optical Mark Recognition.	OCR stands for Optical Character Recognition.
2.	Under this system the document is required to be passed through an optical mark page reader. The page reader will read the printed marks by absorbing light emitted on the document. Reflected light is converted into electric pulses and are sent to recognition logic circuit, where signal is processed.	It is a method of recognition of printed characters by machines. OCR systems can recognise different OCR fonts, as well as type writer and computer printed characters.
3.	Recognises marks.	Recognises characters.
4.	These are used in scoring tests where the examinee has to select one among several options.	Used to process turn around documents and to enter data directly into the computer.
5.	It is very difficult to design the document.	It is easy to design the document.
Both work on the principles of optics i.e. light.		

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25. Impact Printers Vs. Non-Impact Printers.

No.	*Distinction*	*Impact Printer*	*Non Impact Printer*
1.	Hit	These printers use some form of stricking device (hitting device) to transfer ink from an inked ribbon to the paper.	In this type of printer there will be no direct contact between the paper and the printing head. These printers form characters by chemical or electronic means.
2.	Noise	These printers make noise while	Does not make noise while printing.

		printing.	
3.	Copies	Multiple copies can be printed at the same time by using carbon papers.	This type of printers can print only one copy at a time.
4.	Multi colour	It is not possible in impact printers.	It is possible in most of the non impact printers.
5.	Usage	These are mainly used for printing text. Low quality graphics can also be printed with some of them.	This can print both high quality graphics and text.
6.	Different font sizes & styles.	Can print documents with different font sizes and styles.	Can permit documents with different font sizes and styles.
7.	Quality	Medium. (Draft or NLQ)	Very good. (Letter quality)
8.	Areas of usage.	Used in business data processing applications.	Used in the areas of advertising and publishing where quality should be very good.
9.	Stationery	Carbons, ribbons, cartridges are used.	Many of the printers use Tonor.
10.	Examples	DMP, DAISY WHEEL etc.	INKJET PRINTERS, THERMAL, LASER PRINTERS.

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26. Microfilm Vs. Microfiche.

No.	Microfilm	Microfiche
1.	Micro film stays in a continuous form.	Microfiche is cut into pieces.
2.	They are 16mm/35mm roll of film contained in cartridges which can hold 2000-5000 pages.	They are 105 mm film measuring 4 X 6 inches sheets which can reproduce more than 270 page sized images.
3.	It can provide sequential access only i.e. to access a particular record, one has to pass on previous records.	It can provide direct access i.e. to access a particular record, it is not necessary to access previous records.
4.	Access of information is slow.	Access of information is faster.
5.	Can store huge amount of data.	Less storage capacity.

27. Serial Printers Vs. Line Printers.

No.	Serial Printers	Line Printers
1.	Serial printers are printers which can print one line at a time, usually from left to right. However, some printers can also print in bi-	Line printers are printers, which can print one line at a time.

	directional format.	
2.	Serial printers are generally used with microcomputers.	Line printers are generally used with mainframe and mini computers.
3.	The quality of output is high.	Quality of output is poor.
4.	They are low speed printers.	They are generally high-speed printers.
5.	These are capable of graphic applications.	Their graphics capability is limited.
6.	There are two types of serial printers - Dot matrix printers and Daisy wheel printers.	There are two types of line printers - Drum printers and Chain printers.
7.	Speed is measured in Characters Per Second (CPS).	Speed is measured in Lines Per Second (LPS).
8.	It is used where volume of output is limited.	They are used where volume of output is very high.

28. Magnetic Tape Vs. Magnetic Disk.

No.	Magnetic Tape	Magnetic disk
1.	It is a sequential access storage media.	It is a direct access storage media.
2.	Very much economical for making back up copies of data.	Most popularly used secondary storage device.
3.	Data is more secured.	Data is less secured than magnetic tape.
4.	Magnetic tapes are vulnerable to dust or careless handling.	Disks are relatively sturdier and less vulnerable to damage from dust.
5.	Easily portable.	Disk packs require special care during transportation.
6.	Cheap source of storage medium.	Costlier.
7.	Rarely used as it supports sequential access only.	It is widely used because it provides direct access to data.
8.	Slow access devices.	Faster access devices.

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29. Primary Storage Vs. Secondary Storage.

No.	Primary Storage	Secondary storage
1.	Added to the system as a part and parcel of the circuitry.	Added to the system as a supplementary to primary storage.
2.	It is electronic in nature and is usually supplied in the form of chips.	Magnetic or optical in nature and supplied in the form of tapes and disks.
3.	Provides Random access to data.	Provides Sequential / direct access to data.
4.	Volatile i.e. its contents are lost when power is	Non volatile i.e. it does not lose its contents

	lost.	even when the power is lost.
5.	Low capacity.	High capacity.
6.	Fast access to data.	Slow access to data.
7.	High cost.	Low cost.
8.	Generally a computer consists of few MB's of memory.	Generally a computer consists of few GB's of memory.

30. Application Program Vs. Utility Programs.

No.	Application Program	Utility Program
1.	Application programs are written for the purpose of solving specific business / scientific problems.	Utility programs are available for the purpose of supporting the data processing activity.
2.	It is developed using programming language.	It is used in developing application software.
3.	It is used in carrying out the data processing jobs.	It acts as a tool in carrying out the data processing job.
4.	It gives some general solutions for related problems.	It gives specific solutions for specific problems.
5.	Professional programmers write application programs.	Software manufacturers supply the utility programs.

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31. Interpreter Vs. Compiler. / Interpretation Vs. Compilation.

No.	*Distinction*	*Interpretation*	*Compilation*
1.	Meaning	It is a type of translation in which one line is translated at a time.	It is a type of translation where the entire source programme is translated at a time.
2.	Interpreter/ Compiler	The translation software which translates only one line at a time is called Interpreter.	The translation software which translates the entire source programme at a time is called compiler.
3.	Storage	In interpretation every line of source programme is read and translated. The object code is created and immediately executed. When the next line is read & translated, the object code created earlier is not stored.	The entire programme is read and translated at a time. The object programme is generated and stored in the secondary storage device. Using this object programme, the programme gets executed subsequently without compilation.
4.	Translation & Execution	In interpretation, programme translation and execution always happens together line by line.	Programme translation and execution need not happen together.
5.	Number of Translations	Translation has to be done every time the programme is executed.	Translation is one time activity. Future programme executions may be done with the object programme

			without having repeated translation.
6.	Speed	Programme execution is slow.	Programme execution is fast.
7.	Users/Preference	Interpreters are preferred by new learners. (Or) In case the data to be translated is less.	These are preferred by professionals, for business data processing applications at large centers.
8.	Future executions.	Source programme has to be permanently present for all future programme executions.	Source programme need not be present at all times. Future executions may be done only with object programme.
9.	Error detection	Syntax Errors are detected, displayed and corrected line by line.	All syntax errors can be detected, displayed and corrected together.
10.	Security to applications	Gives less security to applications because easily correctable source programmes are permanently stored for all future programme executions.	Gives more security to applications.

32. Multiprogramming Vs. Multitasking.

No.	Multi Programming	Multitasking
1.	Multiprogramming is a technique used to execute number of programs simultaneously by a single processor.	It is the logical extension of multiprogramming and refers to the operating systems ability to execute two or more of a single user's tasks concurrently.
2.	In multiprogramming, number of processes resides in main memory at a time.	The CPU switching between them executes multiple jobs. The CPU scheduler selects a job from the ready queue and switches the CPU to that job. When time slot expires, the CPU switches from this job to another job.
3.	The operating system picks and begins to execute one of the jobs in the main memory.	Here, different processes share the CPU time. The main advantage of multitasking is efficient CPU utilization.
4.	The purpose of multiprogramming is to increase the utilization of the computer system as a whole.	It provides single user with multiprogramming capabilities.

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33. Multiprogramming Vs. Time Sharing System.

No.	Multiprogramming	Time sharing system
1.	Multiprogramming is a processing mode in which several partially completed tasks are processed concurrently.	Time Sharing is a processing system with number of independent, relatively low speed, on line, simultaneously usable stations which are geographically remote from the computer and from each other.

2.	At any time, only one task or job is actually being executed, but within a larger time span of several minutes, the computer is processing several jobs or programs, alternating between actually executing, and performing input/output activities.	Each station provides direct access to the central processor for obtaining instant responses to the questions asked or statements made in an interactive conventional mode.
3.	When one job needs to do input/output another can begin execution. Thus two or more independent programs are executed in the same time span by interleaving their execution.	The speed of the system and the use of multiprogramming allows the central processor to switch from one using station to another and to do a part of each job in the allocated "time slice" until the work is completed.
5.	The advantage of multiprogramming is that overall performance of the system can be enhanced. The speed of the CPU can be used to avoid the delays in waiting for input or output operations.	The response is so fast that the user has the illusion that no one else is using the computer, which creates an impression of having a computer for one's sole use.

34. Multiprogramming Vs. Multiprocessing.

Multi programming is the term used to describe a processing approach in which 2 or more independent CPU's are linked together in a coordinated system. On the other hand, multiprogramming refers to the processing mode in which interleaved execution of 2 or more different and independent programs is carried out by the same computer.

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Multiprogramming is not defined as the execution of instructions form several programs at the same instant in time. Rather, it means that there are number of programs available to the CPU and that a portion of one is executed, them a portion of another and so on. On the other hand, in multiprocessing, instructions from different and independent programs can be processed at the same instant time by different CPU's. Or, the CPUs may simultaneously execute different instructions from the same program.

35. Source Code (Program) Vs. Object Code (Program).

No.	*Distinction*	*Source program (Code)*	*Object programme (Code)*
1.	Meaning	It is a set of instructions written in computer language.	It is a set of instructions written in machine language.
2.	Who will prepare?	It is written by the user in a computer language.	It is generated by a process called compilation or interpretation.
3.	Input/Output	It is input to compilation process	It is the output of compilation process.
4.	Readability	It is readable by the user since it is written by himself using an English like computer language.	It is not readable by the user since it is in machine language.
5.	Modifications	They can be read and modified by the user directly.	They cannot be directly modified by the user. To correct the object programme the corresponding source programme should be

			modified and re-compiled.
6.	Direct Execution	It cannot be directly executed without compilation.	It can be directly executed.
7.	Errors	It can contain both syntax errors and logical errors.	It can contain only logical errors. They cannot contain syntax errors since compilation process removes all syntax errors.

36. Syntax errors Vs. Logical errors.

No.	*Distinction*	*Syntax Error*	*Logical Error*
1.	Meaning	These are programme errors which occur on account of wrong usage of computer language and its rules or syntax.	These are content errors that can be detected from the output of a computer programme. Here the output is different from what is expected either in value or in design or in format.
2.	Where they can Present	These can only be present in object programme since compiler will not convert it into object programme until it is syntax error free.	They may be present both in source programme as well as object programme.
3.	How identified	Can be identified by compilation Software during compilation	Cannot be identified by compiler during compilation.
4.	Both are errors that occur in computer system.		

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37. System Software Vs. Application Software.

No.	*Distinction*	*System SW*	*Application SW*
1.	Meaning	It is an important type of SW which is essential for computer system to be used by the user. Used to improve the performance and maximum utilization of system resources.	It is an important type of software which are created to achieve the end users or applications of the computer system. Used to improve the speed and quality of business activity.
2.	Examples	Operating system, Computer languages, Compilation SW, Utility programmes, Library functions, Diagnostic SW etc.	Software for stores accounting, Financial accounting, Invoicing SW, Payroll programmes etc.
3.	Who produce?	May be prepared by large SW companies like MICROSOFT. Some may also be written by system programmers.	Application SW in the form of readymade application packages may be produced by SW companies. Tailor made application SW may also be written by programmers or end-users.
4.	How prepared?	Prepared using any low level language.	May be prepared using any higher computer language or specification SW like DBMS.

5.	When procured?	It is generally procured along with HW at the time of initial purchase. But few modules may be added later also.	Generally prepared in stages one after another based on user priorities.
6.	Updations	Once prepared doesn't change frequently except for new additions or versions.	Goes through more frequent changes whenever policies and procedures relating to the applications are changed or when application programmes need to be improved for better performance.
7.	Knowledge of Hardware	Detailed knowledge of hardware is required.	This requires detailed knowledge of organization.
8.	HW Independence	System software varies from computer to computer.	Application software varies from organization to organization.

38. Compiler Vs. Assembler.

No.	Compiler	Interpreter
1.	Compiler is a standard program supplied by the manufacturer.	Assembler is also a standard program supplied by the manufacturer.
2.	It converts the high level language program into machine code.	It converts an assembly language program into machine code.
3.	Compiler will be loaded into the computer first and then source program will be input.	Assembler is available within the memory and accepts symbols and mnemonic codes.
4.	Compiler generates an object code of the source program as a result.	It generates machine codes as a result.
5.	Compilers scan the whole program at a time.	It scans the program line after line.
6.	Compiler generates one to many instruction relationship i.e. for one high level language instruction it may generate multiple machine language instructions.	Assembler converts on one to one basis i.e. for every instruction in source code it generates an equivalent machine code instruction.

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39. Third Generation Languages (3 GL's) Vs. Fourth generation Languages (4 GL's).

No.	Third Generation Languages	Fourth generation Languages
1.	These languages are intended for use by professional programmers.	These languages are used by non-programming end-users as well as professional programmers.
2.	These languages require to specify how to perform a particular task.	It is just sufficient to specify the task required to be performed.
3.	Requires that all alternatives should be specified.	Some default alternatives are built in. User need not specify these alternatives.

4.	To solve a particular problem, it requires large number of procedural instructions.	To solve a particular problem it requires less number of instructions.
5.	Program code is difficult to read, understand and maintain.	Code is easy to understand and maintain because of English like commands.
6.	Difficult to learn.	Easy to learn.
7.	Difficult to locate errors and debug.	It is easy to locate and debug errors.
8.	E.g. FORTRAN, COBOL, PASCAL, BASIC, C, etc.	E.g. Visual Basic, Java, C++ etc.

40. High Level Language Vs. Low Level Language.

No.	*Distinction*	*High Level Language*	*Low Level Language*
1.	Hardware independence	It is a computer language which is hardware independent i.e. it can be used in all computers irrespective of their types, sizes and manufacturers.	It refers to hardware dependent computer language. The language differs from one model to another model of the computer.
2.	English like language	These are highly English like languages.	These are not English like languages.
3.	Learning	They can be learned faster with minimum effort and learning is a one time activity.	These can be learned with more effort and time and learning has to be repeated whenever hardware changes.
4.	Coded languages	These are not coded languages.	These are coded languages which use special codes close to the machine language and are called mnemonic codes.
5.	Where used	Used for developing all types of general applications.	Used only for the following specialised requirements. a. To programme and control internal devices of computer. b. To connect or link computers with other equipment. c. In special purpose computers like ATM.
6.	Execution	Slow	Fast
7.	Who uses?	These are used by all software development professionals or application programmers.	These are used only by specialized system programmers.

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41. Self (Direct) Addressing Method Vs. Indexed Sequential File organisation.

No.	Self (Direct) Addressing Method	Indexed Sequential File organisation
1.	In this method a record key is used as its relative address. Therefore, we can compute	The indexed sequential file organization or indexed sequential access method (ISAM), is a

	the record's address directly from the record key and the physical address of the first record in the file.	hybrid between sequential and direct access file organisations. The records within the file are stored sequentially but direct access to individual records is possible through an index.
2.	To access a particular record some calculations are required to be performed.	To access a particular record it is not required to do any calculations.
3.	It does not use any indexes.	It uses cylinder and track indexes for locating records.
4.	There is no simple relationship between the keys of adjacent records.	There exists some simple relation between the keys of two adjacent records.
5.	Insertions and deletions can be easily made.	Insertions and deletions take more time because every time it is required to updata the index.

42. Fixed Word Length Vs. Variable Word Length.

No.	Fixed Word Length	Variable Word Length
1.	In this system all words will have same length.	In this system words will vary in number of bytes.
2.	In fixed word length system every storage location is identified by a specific address.	In this system each set of bytes will have one unique address.
3.	Machines operating with fixed word length have faster calculating capabilities.	The calculating speed of variable word length machines is low.
4.	Fixed word length system maintains memory with less efficiency i.e. lot of memory will be wasted.	Variable word length machines utilises the systems memory with higher efficiency.
5.	Access time (time required to access a particular data) is low.	Access time is high.

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43. Sequential File Organization Vs. Direct access File Organization.

No.	Sequential File Organization	Direct File Organization
1.	Data are arranged / stored in sequence either in ascending or descending order of the record key.	Data are arranged / stored without any sequence or in any specific order.
2.	Only sequential access is possible.	Accessing can be either sequential or direct.
3.	This type of organization is efficient only when there is no need for accessing records in between.	This method is suitable for accessing records in between process runs.
4.	It is suitable for batch processing system.	It is suitable for online and real-time systems.
5.	Identifying individual records is time consuming.	Identifying individual records requires no time.
6.	Does not require any calculation or index for	Requires either calculation or index for storing

	storing and accessing records.	and accessing records.

44. Sequential File Organization Vs. Indexed Sequential Organization.

No.	Sequential File Organization	Indexed Sequential Organization
1.	In sequential file organization, records are written in the same sequence in which they are collected, but they are organized into certain order.	Indexed Sequential Organization is a combination of sequential and direct access file organization.
2.	Ordering of records within the file is according to a specific data field, which is known as key field.	Here files are recorded serially in a logical sequence; indexing or reference techniques are used so that access can be done on a random basis as well as sequentially.
3.	Records appear in sequential file one after another, in key sequence.	Records are updated in place, without the need to create entirely new files during processing.
4.	Sequential files can be read and processed only in the order in which they are recorded.	This method of file organization is used for applications that might require both sequential and random access references.
5.	Sequential organization can be used on all storage media.	It can done only on direct access storage devices.

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45. Sequential File Organization Vs. Random File Organization.

No.	Sequential File Organization	Random File Organization
1.	In a Sequential File Organization, records are written in the sequence of their occurrence.	In Random File Organization Method, record can be written randomly.
2.	Ordering of records within the file is according to a specific sequence.	Ordering of records in random file does not include any specific sequence.
3.	Sequential files can be read and processed in the order in which they are recorded.	Records can be processed or read and written in many locations throughout the stored file.
4.	To process a required record in sequential file it is necessary to read all the records preceding to the required record.	To process or access the required record in random file prior records need not be examined first.
5.	Sequential files can be created on all storage media.	Random file can be created only on direct access storage media.
6.	Sequential file is not suitable for instant inquiry or updating.	Random file is suitable for instant inquiry or updating.

46. Batch System Vs. Real-Time System (or) Batch processing Vs. Real Time processing.

Aspect	Batch System	Real-time System
Time Lag	There is a time lag between the point at which economic event occurs and point	No time lag. Transactions are processed the moment the economic event occurs.

	at which it is reflected.	
Resources	• Less organizational resources needed. Shorter development period and easier to maintain programs. • No idle time. Computer used only when program is run.	• Cost is more for designing the user-interfaces. Pop-up menus, online tutorials, special help menu require additional programming. • Dedicated computer system needed. Therefore, sometime remains idle.
Data Input	Data collected is accumulated over a definite period of time and then processed in batches.	Data can be input at any time and it is processed immediately.
Efficiency Vs. Effectiveness	Processing more transactions at lower unit cost makes it efficient. If process time is not important batch system can be used.	Individual transaction is processed effectively. Very much useful when the system requires latest information at any point of time.
Application	This method of processing is suited in the applications of payroll processing, customer billing etc.	This method is very much suited in the areas of airline reservation, inventory management, railway reservation, sales order processing, etc.
Storage	It is sufficient to store data one sequential access storage devices like magnetic tape, tape cartridges, etc.	Data must be stored on direct access storage devices like magnetic disc, floppies, CD's, etc.
Delay	Some amount of delay is inevitable.	Even minute delay is not acceptable.

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47. Interactive Processing Vs. Batch Processing.

Aspect	Interactive Processing	Batch Processing
Meaning	It is a type of processing mode in which continuous dialogue exists between the user & the computer. It is also called "transaction driven processing". In this method transactions are completely processed on an individual basis.	Under this method, a batch of transactions is accumulated; batch totals are calculated and stored on a floppy diskette or other media. The transactions are processed and the required master files are updated.
Transaction Method	Transactions are processed completely on an individual basis through all the relevant processing operations before dealing with next transaction.	It processes transactions in batches through each processing stage at a definite interval.
Human Interaction	Human interaction is very high i.e., every transaction processing requires human interaction.	Human interaction is very limited.
File Updation	It updates files instantaneously as transactions occur & are executed.	Files are updated only for the previous run.
Query Response	It can provide immediate response to a query.	Can't provide latest and updated information at any point of time.
Cost	It is very costly to develop such a system.	Comparatively it is cheaper to develop a system under batch processing mode.

48. On line System Vs. Real Time System.

The term on-line processing and real time processing are used interchangeably but there is a basic difference between the 2. On line processing refers to processing of individual transactions as they occur from their point of origin. This processing mode utilises direct access devices such as magnetic disk and number of terminals connected to and controlled by a central processor. It provides multi access to information files by terminal users and also enables them to update files with transaction data. Aside from transaction processing and file updating, inquiries are also handled by the online processing system. It also ensures that the records are in updated status at any time.

The term real time processing, on the other hand, refers to the technique of updating files with transaction data immediately after the event to which it related occurs. Real time processing is basically, on line processing with one specialty in inquiry processing. On line updating in real time usually leads to transactions as a by-product. The response of the system for the inquiry itself is used to control the activity. It would normally differ form one activity to another activity. The response of a real time system is one type of feedback control system. An on-line production data collection system that simply accepts input and utilised it for payroll and costing purposes can't be treated real time, but if, on the other hand, the system is designed to provide immediate information to monitor the production process, it is real time processing.

49. Online Systems Vs. Batch Applications.

No.	Online Systems	Batch Applications
1.	Under online processing, individual transactions will be processed as they occur, from their point of origin. Data can be captured through terminals located at several crucial points. Data collected through these terminals will be processed and stored at central location.	Under this method, a batch of transactions is accumulated; batch totals are calculated and stored on a floppy diskette or other media. The transactions are processed and the required master files are updated.
2.	At any point of time the system provides latest and updated information.	It can't provide latest and updated information at any point of time.
3.	No such system exists.	To verify the validity of data entry batch totals are computed.
4.	Cost of development and maintenance is high.	Cost of development and maintenance is low.
5.	To collect data from the point of horizon terminals are installed at required places.	No need to place such terminals. Even if they are used, only dumb terminals are used.

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50. Voice Synthesizer System Vs. Voice Recognition System.

No.	Voice Synthesizer System	Voice Recognition System
1.	Voice Synthesizer (or Voice-Output Device) is a system which converts data in main storage to vocal sounds understandable to human beings.	Voice Recognition system (VRS) is a hands-free voice interactive computer interface in which user can access the computer system by talking to it.

2.	It is an output technique.	It is an input technique.
3.	These systems are designed to replicate the voice of human beings.	They were designed for the help of physically handicapped and non-typists people to work with the computer efficiently.
4.	The output is in the form of speech and the speed and pitch of the speech can be adjusted.	Voice command driven applicants are very effective and are very well received by inexperienced users.
5.	They are commonly used in a voice output presentation in different languages for different users, multimedia presentation and children education software.	Most speech systems are used for text dictation or for single command voice menu option.
6.	Even though it is expensive it widely being used in several areas.	VRS technology is still embryonic and somewhat restricted in use.
7.	Dedicated voice synthesizing systems are available which can be connected to the computer through parallel port. The same work can also be performed by software.	It is completely software oriented. Total work will be performed by a special purpose software.

51. Computer Network Vs. Distributed System.

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A computer network is a collection of computers and terminal devices connected together by a communication system. The computer may include large-scale computers, mini computers, terminals, workstations and miscellaneous devices. 2 computers are said to be inter connected if they are capable of exchanging information. The connection need not be via a copper wire; but lasers, u-waves and earth satellites can also be used. Computer networks increase the reliability of computer resources and facilitate overall system development. They also satisfy the prime objective of resource sharing which includes device sharing, file sharing, program sharing and program segmentation.

A distributed system is one in which the computing functions are dispersed among several physical computing elements. Computer systems are arranged in a computer network, with each system connected to one or more other systems. A distributed system is both a technological and organisational concept. Its premise is that information processing can be more effective if computer hardware, data, software and in some cases, personnel are moved physically closer to the people who use these resources. In distributed system, users have greater control over their computing environment.

Network may or may not be distributed system, depending on how it is used.

52. Local Area Network (LAN) Vs. Wide Area Network (WAN)

No.	*Difference*	*Local Area Network*	*Wide Area Network*
1.	Spread/ Coverage	A LAN is restricted to a limited geographical coverage of few kilometers.	WAN spreads over greater distance and may operate nationwide or even worldwide
2.	Data	Fewer data transmission errors	When compared to LAN, error rate

	transmission errors.	occur in case of LAN because the distance covered in less.	is more because the distance covered is more.
3.	Data transmission speed.	Data transmission speed is much higher in LAN than in WAN. Typical transmission speeds in LAN'S are 0.1 to 10 MBPS.	In a WAN the data transmission speed ranges from 180 to 9600 Bits per second
4.	How nodes are connected?	In a LAN, computers, terminals and peripheral devices are usually connected with wires and coaxial cables.	But in WAN there may not be direct physical connection between various computers.
5.	Cost of transmission.	The cost to transmit data in a LAN is negligible since the transmission medium is usually owned by the user organisation.	Cost will be high because the transmission medium used is leased lines or public systems such as telephone lines, microwaves and satellite links.
6.	Communication Mode	Communication may take place just by a way of direct cabling.	Communication takes place by way of telecommunication cables, satellites or microwaves.
7.	Security	Security is not that much important because the network runs within the organisation.	Security is very important because the network has to run outside organisation also.

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53. Serial Transmission Vs. Parallel Transmission.

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

Advantages:

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

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

Parallel Transmission:

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

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

Disadvantage:

- Not suitable for transferring data over long distances. As it uses parallel paths, cross talk may occur. To minimise cross talk, cable length should be limited.
- It is costly. (Because there should be separate channel for each bit)

54. Difference between Serial transmission and parallel transmission.

No.	Serial transmission	Parallel transmission
1.	The bits of each byte are sent along a single path one after the other.	In parallel transmission, there are separate parallel paths corresponding to each bit of byte.
2.	Bits in a byte are transmitted one by one.	All character bits are transmitted in parallel, at a time.
3.	It is used to transfer data over long distances.	It is used to transfer data to limited distances.
4.	The rate of data transmission is very slow.	The rate of data transmission is very high.
5.	It is used where less volume of data is to be transmitted.	It is used where more volume of data is to be transmitted.
6.	It is economical.	It is costly.

55. Synchronous Transmission Vs. Asynchronous Transmission.

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No.	Synchronous	Asynchronous
1.	In this transmission bits are transmitted at fixed rate.	In this transmission takes place in form of words accompanied by stop and stop bits.
2.	This allows characters to be sent down the line without start-stop bits.	Transfers the data with start-stop bits.
3.	It allows data to be sent as a multi-word blocks.	Data transfer takes place in the form of words.
4.	Uses a group of synchronization bits.	No special synchronization bits to synchronize the equipment.
5.	Rate of transferring data is faster.	The transfer rate is slow.

56. Star Network Vs. Ring Network.

No.	Star Network	Ring Network
1.	It is a type of network topology in which all nodes are connected to a central computer/hub through dedicated cables.	It is a type of network topology in which all nodes are connected in the form of a circular chain.
2.	The communication takes place between the nodes through the hub/computer only i.e. all communication between terminals must pass through hub/computer.	The communication takes place by each node to receive and check for the message i.e. every node receives message and passes it to the next node.
3.	A broken connection between hub/central	A broken connection between nodes leads to

	computer and node does not affect the rest of the network.	failure of entire nework.
4.	Failure in the hub/central computer affects all nodes connected to that hub.	Failure in one node does not affect the entire system.
5.	The signal becomes weak when it has to travel long distances. To avoid it, repeaters are required to be used.	Repeaters are not needed. Every computer acts as a repeater.
6.	It is very easy to add/remove a node from the network.	It is difficult to add/remove a node from the system.

57. Internet Vs. Intranet.

No.	Internet	Intranet
1.	The Internet is a global network of computer networks that are formed by various educational, commercial, Government, non-profit and military organizations.	On the other hand intranet is a type of information system that facilitates communication within the organization, among widely dispersed departments, divisions and regional locations. Intranet connects people together with Internet technology using web browsers, Web Servers and Data warehouses in a single view.
2.	This is not being developed and controlled by a single person or organisation.	It is developed and controlled by private individuals and organisations.
3.	Internet is a public network. So, any body can log into the network and perform any action at his choice.	It is a private network and access to private individuals is restricted by user names and passwords.
4.	Thousands of databases exist which can be accessed and used by private individuals.	Only authorised persons are allowed to access the data available in organisation's databases.
5.	An internet can be defined as a network of networks.	An intranet can be a LAN or WAN that belongs exclusively to a corporation.
6.	Any node can transmit a message to any other node, along with communication channels, via the intermediate nodes. Internet uses are many; some of them are given below: Communication, Data Retrieval, Data publishing, etc.	Several applications of Intranet include: (a) Supplier management (b) Inventory management (c) Distribution management (d) Channel management
7.	Acts as an information service to retrieve the information world wide.	Acts as an information service to retrieve and share files within the organisation.

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58. Firewall Vs. Encryption.

No.	Firewall	Encryption
1.	They control the flow of traffic between the Internet and the firm's internal LANs and	This allows information to transit the Internet while being protected from

	systems. They are setup to implement the security policies desired by the organisation.	interception. There are two basic approaches to encryption: Hardware encryption and Software encryption.
2.	It is software oriented.	It is both hardware and software oriented.
3.	Controls the flow of traffic between the Internet and the firms internal LANS and systems.	It protects the information transmitted through Internet from eavesdroppers.
4.	It is defined based on specific security policies of the organisation.	It is a generalized policy with reference to information transmission.
5.	It is an effective means of protecting the firm's internal resources from unwanted intrusion.	Restricts the tampering of information from interception while in transmission.
6.	May be established for the entire LAN or for a specific application.	It will be application specific.

59. Data Administrator (DA) Vs. Data Base Administrator (DBA)

No.	Data Administrator (DA)	Data Base Administrator (DBA)
1.	A Data Administrator logically defines data and also advises the users on data collection procedures.	Data Base Administrators physically define the data and prepare programs to create data.
2.	They answer and educate the end users and determine their requirements.	They answer and educate the programmers and define the programming requirement.
3.	They develop standards for data definition.	They implement the standards for data definition.

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60. Data Definition Language Vs. Data Manipulation Language.

No.	Data Definition Language	Data Manipulation Language
1.	Data definition language is the link between the logical and physical structures of the databases.	It provides techniques for processing the database.
2.	It is used to define the physical characteristics of each record.	It is used to perform operation on data such as retrieval, sorting and display.
3.	It provides for physical and logical data independence.	It provides for independence of programming languages.
4.	It describes the schema and sub-schemas.	It enables the user and application programs to process data on a symbolic logical basic rather than on physical location basis.
5.	It takes care as to how the data is maintained in physical storage.	It separates the user from physical storage.

61. Database Vs. Database Management System (DBMS)

No.	Data Base	Data Base Management System
1.	Database is a collection of related data necessary to manage an organization and excludes temporary data like input documents, reports and intermediate results obtained during processing.	DBMS is a set of procedures which manage the databases and provide access to the database in the form required by an application program.
2.	It models the data resource of an organization using the relationships between different data items, which is independent of any application program.	It ensures that the necessary data in the required form is available for different applications of different users of an organization.
3.	When data is stored in a database it becomes independent of other programs. So, it can processed, retrieved very easily.	Database management system (DBMS) provides flexibility in storage and retrieval of data and production of information.
4.	Database represents data belonging to the entire organisation.	It represents software which manages such database.
5.	Data can be arranged in any of the following ways – Hierarchical, Relational or Network databases.	Such data can be maintained by ordinary database management systems or relational database management systems.

62. Logical Record Vs. Physical Record.

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No.	Logical Record	Physical Record
1.	A logical record contains all the data related to a single item. It may be a payroll record for an employee, or a record of all of the charges made by a customer in a departmental store.	A physical record refers to the actual portion of a medium on which data is stored. It may be group of pulses recorded on a magnetic tape or disk, or a series of holes punched into paper tape.
2.	A logical record is independent of its physical environment.	Portions of the same logical record may be located in different physical records or several logical records or parts of logical records may be located in one physical record.
3.	It refers how data is presented to the user.	It refers how data is actually stored in the computer.

63. Structured Query Language (SQL) Vs. Query By Example (QBE).

No.	Structured query Language (SQL)	Query By Example (QBE)
1.	SQL is a query language for finding out the required data from the RDBMS by asking some standard questions.	QBE is a query language where queries are framed through examples.
2.	It is usually a Character oriented interface.	It is Graphic oriented interface.
3.	The users request data by issuing	The users can request data by typing values

	instructions that are close to English.	or expressions into the fields of a form or grid.
4.	It contains the statements that describe the data contained in the database.	It uses grid like structures to receive the criteria data.
5.	It requires the internal structure of the data tables.	It displays a list of tables in the form of a window grid or dialog boxes and allows selecting interactively.

64. Vertical Partitioning Vs. Horizontal Partitioning

No.	Horizontal Partitioning	Vertical Partitioning
1.	Horizontal Partitioning breaks a relation into multiple record specifications by placing different rows into different records based upon common column values.	Vertical Partitioning distributes the columns of a relation into separate files, repeating the primary key in each of the files.
2.	Each file created from the partitioning has the same record layout.	Each file created from a vertical partitioning does not have the same record layout since different record fields will be extracted.
3.	It is beneficial when different categories of rows of a table are required to be processed separately.	It is beneficial when different particulars about the same record should be made available to different departments.
4.	Example: Breaking of a Customer Record File into different regional customer files based on the value of a field Region.	Example: An employee related details can be broken into Payroll Particulars for the Finance Department; and Past Experience, Performance Evaluation Particulars for the HR Department.

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65. Auditing Around the Computer Vs. Auditing Through the Computer.

Particulars	Auditing around the Computer (Black Box Approach)	Auditing through the Computer (White Box Approach)
Recognition of Computers	Under this approach computers are treated as mechanical book keeping aids.	Computers are used as “live” and dynamic devices, which add value to the process of auditing. They are the target of auditing.
Focus of Audit & Means of Audit Assurance	The focus of audit is to take voluminous reports and outputs, and compare “input vouchers” with “system outputs” to obtain audit assurance.	The focus of audit is to peruse the accounting system and software used-to ensure that they provide audit assurance on the various aspects of control.
Use of Computers	Computers are only considered as systems, which provide legible printouts of the accounting transactions. Auditors traced transactions to the “black box” and picked up the trail on the other side by examining printouts.	Computers are used to check calculations, to compare the contents of two files, to examine files for missing amounts, and to analyse accounting data by finding ratios etc.

Use of CAAT's	No regard is paid to the transformation of data that takes place inside the computer.	CAAT's and audit software tools are used to analyse transformation of data.

66. System Flowchart Vs. Program Flowchart.

No.	System Flowchart	Program Flowchart
1.	It is designed to present an overview of the data flow through all parts of a data processing system.	It is designed to present the logic involved in the problem.
2.	It represents the flow of documents, the operations or activities to be performed and the persons or workstations involved.	It represents the flow of data in the processing of the problem logic.
3.	It represents how input data is prepared and the medium or device used.	It represents the input required and output generated by the program.
4.	It indicates the intermediary and final output prepared and the medium and devices used for their storage.	Represents actual processing of data to convert into information.
5.	It includes the sequence of operations involved.	It includes the sequence of operations in solving a specific problem.

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67. Centralized Processing Vs. Distributed Processing.

No.	Centralized Processing	Distributed Processing
1.	It refers to an environment consisting of a large mainframe computer system that supports multiple users and multiple application programs.	Distributed processing seeks to spread the computing needs across the organization. There may be one large central computer with a series of small computers or mini or microcomputers or there may be number of computers of equal size scattered geographically.
2.	Users can access computer resources via hundreds of remote communication devices including on line terminals used to input data and printers to obtain reports.	In distributed processing the individual computers are tied together through a high-speed data communication network.
3.	Highly skilled, technically trained specialists are required to operate the system.	People with functional knowledge can also manage the system.
4.	This mode of processing is comparatively cheap. It also offers better control and protection of data.	This mode of processing incurs more expense with limited security, controls and protection of data.
5.	Can work effectively in small organisations.	Suitable even for big organisations.
6.	Generally, a dumb terminal will be allotted to each employee.	Generally, an intelligent terminal will be allotted to each employee.
7.	If the central computer fails, the entire	Even if the central computer fails, the

	network stops performing.	network continues to function.

68. File Access Method Vs. File Organization Method.

No.	File Access Method	File Organization Method
1.	Access refers to reading of data from the file.	Organization refers to the physical arrangement of data on the files.
2.	There are two ways of accessing the data i.e. sequential and direct.	There are five ways of organizing the data.
3.	Sequential access refers to reading the data sequentially.	Serial and sequential access allows storing data in a particular order.
4.	Direct access refers to reading data without any order.	Self-addressing, ISAM, random methods allows to store data without any order.
5.	Direct access is possible only on direct access storage devices like magnetic disk or compact disk.	Depending upon the organization requirement, one of the media will be selected.

69. Loader Vs. Linker.

Both loader and linker are system software. However, a loader is a component of the operating system that locates a given program which can be an application program or even a part of the operating system from the offline storage such as a hard disk, and then loads it into the random access memory.

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On the other hand, a linker is used to perform the linking process. Any program written in high level or assembly language has to be translated into machine language (object program) before it can be run on a computer. Usually, a program is split into number of small modules. These modules are compiled or assembled individually. This results in number of object programs or modules. All these individual object modules are to be combined or linked to create one single object module before executing the program on the computer. This process of linking is done by Linker.

A linker enables a computer system to access modules, subroutines, overlays and other segments of an application program that are stored on the disk. The linker finds the required program segment and sepervises the transfer of computer control to the segment to be executed. The linker also enables the program to access standard subroutines stored for the convenience of users.

No.	Loader	Linker
1.	It is system software provided as an additional component of operating system.	It is system software provided as a component of language translators.
2.	It is used to load operating system components or application from secondary memory to main memory.	It is used to look the modules of an application and to load them to main memory.
3.	It is used in loading individual components of operating system or application.	To link and load the components of applications.
4.	It controls and supervises the transfer of	It controls and supervises the transfer of

	operating system components.	program modules.

70. Parity Check Vs. Echo Check.

No.	Parity Check	Echo Check
1.	Parity check is among the most effective hardware controls that provide a check on the integrity of data representation system.	Echo check is a hardware check applied to check the mechanism of the input/output devices.
2.	Parity checks provide timely detection of errors of loss/gain in a bit as a result of dirt, magnetic storm etc.	It verifies whether a device has been activated to carry out an operation, which it has been instructed to perform.
3.	It is an extra bit that is added to the code for each character in order to make the number of 1 bit odd (or even).	The echo check verifies that the equipment was activated rather than testing the actual results obtained.
4.	The oddness (or evenness) of the bits is checked to detect loss of bits during transmission of data.	Example: When the data channel is ready to transmit data to the printer, it transmits a signal that activates the printer. If the printer is ready, it sends an echo signal to the data channel. If the printer does not send the echo signal, the data channel postpones transmission and signals the operator that the printer needs attention.

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71. Throughput Time Vs. Turnaround Time.

Distinction	Throughput Time	Turnaround Time
Meaning	Throughput is measure of the total amount of processing that a computer system can complete over a fixed period of time.	Turnaround time refers to the elapsed time between the submission of a batch job and the availability of the output from the computer center.
Operating Time	In batch-serial environment, throughput time of a computer will be comparatively lesser than Turnaround Time.	In batch-serial environment turnaround time is longer.
Use of Multiprogramming	By using multiprogramming, the total throughput of a computer can be increased since the CPU does not wait for input-output of the programs it is executing.	In multiprogramming environment, the turnaround time for short jobs can be reduced.

72. Virus Vs. Worms.

No.	Virus (May 1999, Nov 2001)	Worms
1.	Viruses are self-replicating program code that are inserted into other executable code.	Worms are destructive programs that may destroy data or utilize computer and

		communication resources by duplicating themselves.
2.	They may lie dormant for some time before getting triggered by certain events or occurrences, such as a date or on being copied at a pre-specified number of times.	Worms run independently and travel from machine to machine across network connections.
3.	They are not capable of self-actuating.	They are self-actuating and self-sustaining.

73. ALU Vs. CU

No.	ALU	CU
1.	It performs all arithmetic and logical operations.	It controls input-output devices as in the brain (or) Central nervous system of the human body.
2.	It performs the real execution of instructions.	It does not perform any actual processing on the data.
3.	It receives the data and information stored in the storage unit and performs all necessary operations and are released to an output device.	It selects, interprets and looks after the execution of the program instructions and it is used to direct the entire system's operations.
4.	The data flows between this unit and the storage unit during processing.	It orders and directs the flow of sequence of operations and data within the computer.

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74. Difference between PROM and EPROM.

No.	PROM	EPROM
1.	It is programmable Read Only Memory.	It is Erasable Programmable Read Only Memory.
2.	Data can be stored only for one time. Data once stored can't be changed or erased.	Data can be stored for any number of times i.e. old data can be removed and fresh data can be recorded once again.
3.	Alteration of data is not possible here. Once data is stored it is permanent.	Alteration of data is possible here. If it is required to change data, it is sufficient to expose it to ultraviolet rays. Now it is ready to use once again.

75. Semi-conductor memory Vs. Bubble memory.

Semi Conductor memory is made up of very thin silicon chip which contains 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 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 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 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 thousandths of a centimeter in size, can be moved across the garnet film by electric charge. 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. Thus it can be bused for auxiliary storage. Bubble memory has high potential because of its low production costs and 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 used as an auxiliary storage in portable computers.

76. Text editor Vs. Word processor.

Text Editors can edit plain text only and does not offer formatting features. The user must hit ENTER at the end of each line. They are good for short documents or e-mail text bodies, HTML, web pages and writing programs.

Word Processors edit text and allow embedded formatting for words, paragraphs and whole documents. They also support word warp, margins and different typefaces in the same document.

Word processors are specifically designed to prepare such document material as letters and reports whereas text editors are designed to manipulate non-document instructions in computer programs or data. Text editors lack the text formatting and document printing capabilities of word processors.

77. Type face Vs. Font.

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A typeface is set of characters making up an alphabet that all share similar design characteristics (this says nothing about size, weight, style, etc). A font is a typeface of a particular point size, weight and style. For example, "Times-Roman" is a typeface, but "Times-Roman, 12 point, bold, italic" is a font.

ALL THE BEST

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