UNIT-I : COMPUTER SYSTEM AND ORGANISATION CHAPTER-1 BASIC COMPUTER ORGANISATION



TOPIC-1 Computer System

Revision Notes

• A computer is an electronic device that can perform a variety of operations in accordance with a set of instructions called program. In other words, we can say that computer is an electronic device which manipulates the data according to the list of instructions.



- Strengths of Computer :
 - Much faster as compared to human beings.
 - Can store a large amount of information in very small space.
 - Immune to tiredness.
 - Computers can perform repetitive jobs efficiently.
- ➢ Weaknesses of Computer :
 - Computer cannot take decisions on its own.
 - It needs to be told each and every step.
 - Need special languages to program.
- > A Computer works on the IPO principle ie.

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Input -> Process -> Output.
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- Based on this, these use some components to perform input, some components to do processing and some components to provide output.
- Input Unit : It takes the input i.e. instructions from the user and converts it in the binary form so that it can be understood by the computer. Input unit is formed by the input devices connected with the computer, e.g : keyboard, mouse, etc.
- > Central Processing Unit (CPU) : It is known as the brain of the computer. It has three components :
 - **Control Unit (CU) :** It controls and guides interpretation, flow and manipulation of data and information. It sends control signals until the required operations are properly done by ALU and memory unit (storage unit).
 - Arithmetic and Logic Unit (ALU) : It performs all the required arithmetic and logical operations to perform the task.

- Memory Unit (Storage Unit) : It comprises of primary and secondary memory unit.
- Hardware : All the physical components of the computer system are known as hardware. e.g.: keyboard, mouse, monitor, printer, etc.
- Software : Software represents the set of programs that govern the operations of a computer system and make the hardware run smoothly. Software can be classified in three types :
 - **System Software :** These software are mandatory for all computer systems to work. For example : Operating systems like BOSS, Windows and language processors like assembler etc.
 - Application Software : These software are made to perform the specific task. For example : WordPad, MS-Word etc.
 - Utility Software : Software that assists the computer to perform functions like data backup, virus removal, scanning, defragmenting, etc. For example: Antivirus, disk defragmenter, etc. .

Know the Terms

- > **Data** : Data is the collection of facts and figures.
- > **Information :** Meaningful content extracted from data.
- > **Program :** Set of instructions that direct the computer.
- Commands : Special codes or keywords that the user inputs to perform a task.
- > Input : Process of entering data and instructions in the computer.
- > Storage : Saving data and instructions to make them readily available for future use.
- Process : Performing operations (arithmetic or logical) on data to convert them in useful information.
- > Output : The process of producing useful information or result for the user

TOPIC-2 Mobile System



Mobile System Organization

- As a mobile system runs on battery power, a mobile's CPU has a little power.
- Given below are the basic components of a mobile system.

- Mobile Processor It receives commands, makes instant calculation, plays audio / video, stores information and sends signals throughout the device. It has following two sub units.
 - **Communications Processing Unit** is responsible for phone calls management. Its digital signal processor helps it work with RF Transceiver and Audio subsystem.
 - Radio Signal Management Unit connects SIM to the base stations through radio signals.
 - Application Processing Unit governs controlling all types of operations of a mobile system.
- Mobile system Memory is of two types
 - RAM (Random Access Memory) is the work memory of mobile system and does not store information
 once the device is turned off.
 - ROM (Read Only Memory) is part of internal storage. It is Flash memory or EEPROM. It has operating system and some pre-installed apps on it.
- > Display Subsystem provides display, touch sensitive interface and keyboards.
- Camera subsystem has an integrated Image Signal Processor, ensures instant image capture, high-resolution support, image Stabilization and other image enhancements.
- Storage or external storage or expandable storage comes in the form of SD or micro SD cards.
- > Power Management Subsystem provides power to a mobile system.
- A mobile phone is a handheld wireless device that allows users to make and receive calls and to send text messages.
- A mobile phone is also known as a cellular phone or a cell phone.
- Mobile phones belonging to GSM (Global System for Mobile Communications) network became capable of sending and receiving text messages.
- > MMS- Multimedia Messaging Service is used to send and receive images.
- > A mobile phone with advanced features similar to a computer is called a smartphone.
- The cellular network is composed of cell sites scattered throughout the world. Mobile phone operates on a cellular network.



Revision Notes

CPU is a multipurpose, programmable logic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to those instructions and provides results as output.



Block diagram of basic computer organization

Components of Microprocessor :

2. Bus **3.** Registers **2.** CU

- CPU: it is an acronym for Central Processing Unit. It controls all the operations of a computer. It has three components:
 - (i) Arithmetic Logic Unit (ALU)
 - (ii) Control Unit (CU)
 - (iii) Registers

1. CPU

- Bus : It refers to the collection of wires through which data is transmitted from one part of computer to another. It is of 2 types : (i) Internal Bus, and (ii) External Bus.
- Characteristics of microprocessor :
 - (i) Instruction Set
 - (ii) Bandwidth
 - (iii) Clock Speed
- Classification of Microprocessor :



Know the Terms

- > Arithmetic Logic Unit (ALU) : It performs all the arithmetic and logical operations of the computer.
- > Control Unit : It controls all the functions of the computer like input, output, storage and processes.
- > Registers : It is a small amount of very fast memory that is built into the CPU. It is very expensive.
- > Internal Bus : It is a bus which connects all the internal components of computer like CPU and main memory.
- External Bus : It connects the different external devices, peripherals, expansion slots, input/output ports and drive connections to the rest of the computer. External bus is also known as expansion bus.
- Instruction Set : The set of instructions that a microprocessor can execute.
- Band width : The number of bits processed in a single instruction.
- Clock speed : The clock speed determines how many instructions per second a processor can process. It is given in megahertz or gigahertz.
- CISC : It is acronym for Complex Instruction Set Computing. The CISC architecture contains a large set of computer instructions that range from very simple to very complex and specialised.
- RISC : It is acronym for Reduced Instruction Set Computing. It has relatively limited number of instructions. It is designed to perform relatively small number of operations so that it can operate at higher speed.
- EPIC : It is acronym for Explicitly Parallel Instruction Computing. It refers to architecture in which features are provided to facilitate compiler enhancements of Instruction Level Parallelism in all programs while keeping hardware complexity relatively low.



Revision Notes

> Order of Magnitude of Data :

Metric system value (used to	Notation	Actual value
describe data transfer rate)		(used to describe data storage)
(in Bytes)		in Bytes
103	Kilo bytes (KB)	1024
106	Mega byte (MB)	(1024) ²
109	Giga byte (GB)	(1024) ³
1012	Tera byte (TB)	$(1024)^4$
1015	Peta byte (PB)	(1024) ⁵

Classification of Computer Memory:



- Primary Memory : It is the internal storage which is used by our computer system to store data and instructions while processing. It is temporary memory and is volatile in nature. It is directly accessed by CPU. It is of two types viz. RAM and ROM.
 - **1. RAM :** It is acronym for Random Access Memory . It is a type of Primary memory and is also known as read and write memory as it can be used for both the purposes. It can be of following two types: .
 - (i) **SRAM** : It is acronym for Static Random Access Memory It is a type of memory that requires a constant power supply in order to hold the data and information. These are made of flip-flops.
 - (ii) **DRAM** : It is acronym for Dynamic Random Access Memory. The term dynamic indicates that the memory is be constantly needed to be refreshed otherwise it loses its contents. It is the most common kind of RAM used in personal computers. These are made of transistors and capacitors.
 - 2. ROM : It is acronym for Read Only Memory. It provides non-volatile storage of data. We can access any memory location of ROM by supplying its address. It is of following types :
 - (i) **PROM**: It is acronym for Programmable Read Only Memory. It is a computer memory chip which can be programmed once it is created. But once it is programmed, then it cannot be changed or it is not re-programmable.
 - (ii) EPROM : It is acronym for Erasable Programmable Read Only Memory. It is a computer memory chip on which the written information can be changed as per the requirement. Its contents can be erased by using Ultraviolet light rays of a specific frequency for a specific period of time.
 - (iii) EEPROM : It is acronym for Electrically Erasable Programmable Read Only Memory. It is a PROM which can be erased and reprogrammed using an electric charge. It can erase selecting.
 - (iv) FLASH EPROM : It is same as EEPROM but is much faster. It erases fully and solective eraseer is not possible.
 - (v) MASK ROM : Its contents are programmed by the integrated circuit manufacturer (rather than by the user). The terminology mask comes from integrated circuit fabrication, where regions of the chip are masked off during the process of photolithography.
- Secondary Memory : It is also known as secondary storage. Unlike primary memory, it is used by our computer system to store a large amount of data. It is non-volatile in nature and is not directly accessed by the CPU.
- Cache Memory : It is a smaller, faster memory used by a CPU to reduce average time to access data from main memory.
- Magnetic Storage : It is a magnetic medium which can be used to store large volume of data. It uses magnetic bead to read and write data. It gets the data to and from a magnetisable medium like plastic tape coated with fine particles of metal. It can store large volume of data but this data is slowly accessed.
- Optical Storage : Optical storage medium holds data in digital form. It uses a laser to read and write data Its storage capacity ranges upto 8GB.
- Compact Disc (CD) : It is an optical media that is used for electronically recording, storing and playing back audio, video, text and other information in digital form.
- Digital Video Disc (DVD): It is also known as Super Density Disc(SDD) or Digital Versatile Disc(DVD). In appearance, they are somewhat similar to CDs but they have comparatively more storage capacities than that of CD.

- Pen drive is a storage device that includes flash memory with an integrated Universal Serial Bus (USB) interface. These are typically removable and rewritable and physically much smaller then an optical disk.
- Blu-ray Disc (BD) is a digital optical disc data storage format designed to supersede the DVD format. It is capable of storing high definition video resolution (1080p). It uses blue-violet laser to seed and write data with high precision. Its storage capacity is up to 50 GB.



Revision Notes

- Hard disk memories store information on one or more circular platters or disks which are continually spinning.
- > The rotating disks are coated with a magnetic material.
- > These have space between them.
- > Information is recorded as tiny magnetic spots.
- > Heads to record or read data are mounted on access arms.
- Information is recorded in bands.
- > Concentric circles on the magnetised surface of the magnetic disks are known as tracks.
- > Tracks are divided into pie-shaped sections called sectors.





- > Input devices
- > Input unit is used to accept data and instructions from the user.
- > Keyboard is used to type in letters, digits and commands.
- > Mouse is a pointing input device.
- Microphone is used to send input to computer.
- ➤ A scanner creates an electronic form of the printed image.
- > A touch screen can detect where on the screen surface you are touching.
- > A barcode reader is a handheld device that is used to obtain data contained in a bar code.
- Output devices
- > Output unit is responsible for producing the output in user readable form.
- > Monitor displays information in a way similar to that shown on a television screen.
- > The picture on a monitor is made up of thousands of tiny coloured dots called pixels.
- > CRT contains an electron gun at the back of the glass tube.
- Liquid Crystal is a material used to create each pixel on the screen in LCD.
- > TFT (Thin Film Transistor) is the device within each pixel that sets the charge.
- > PDP (Plasma Display Panels) are flat panel display.
- > Plasma technology utilises small cells containing electrically charged ionised gases.

- OLED Monitors create from pushing an electronic current through organic materials, causing these materials to glow.
- > In impact printers, there is mechanical contact between the print head and paper.
- Speakers receive the sound in form of electric current from the sound card.
- > The Plotter is a graphic output device used to create drawings on paper.
- A port is a connection point of interface between a computer and internal or external devices. Some common types of ports are Serial Port, USB Port, Bluetooth, PS/2 Port, Infrared Port, Firewire Port.
- Serial Port : It is also known as COM Ports (communication ports). These are used to connect devices such as mouse, modem, etc. In this type of ports, only 1 bit information can travel at a time.
- Parallel Port : It is a type of port in which data are sent and received simultaneously over several parallel channels. It can transfer upto 8 bits of data at a time. It is used to connect peripheral devices such as printer.
- USB Port : It is acronym for Universal Serial Bus Port. It comes under serial port and is used for short distance digital data communication. It allows data transfer between devices with little electric power.
- Bluetooth : It is a wireless technology standard for exchanging data over short distances (using short-wavelength) from fixed and mobile devices.
- > **PS/2 Port** : It is a type of port developed by IBM for connecting a mouse or a keyboard to the computer.
- Infrared Port : It is also known as IR port. It is a meta port which words and receives, infrared signals from other infrared enabled devices.
- Firewire Port : It is a serial bus interface standard for high speed communication and real time data transfer.

TOPIC-7 Battery

- > Battery supplies power to a device so that it can do work without power cord.
- > Laptops are powered by battery and can work for several hours.
- > Laptops and cell phones use rechargeable batteries.
- > Three types of computer batteries:
 - (a) Backup or CMOS battery (power the CMOS chip)
 - (b)Bridge battery is used in portable computers as a temporary backup for the main battery.
 - (c) Main battery in portable computers is an alternative to a power cord.
- LI-ION (Lithium Ion) used in cell phones. These are expensive but perform without the memory issue. These are fragile technology requiring protector circuit.
 - It is used where very high energy density is needed and cost is secondary.
 - It has a low self discharge.
 - Energy density is twice that of the NICAD.
 - It has 500 800 charging cycles.
 - It is susceptible to damage from over charge and over discharge.
- > Li-polymer (Lithium polymer) is a lower cost version of Li-ion.
- > NICAD (Nickel Cadmium) is a rechargeable battery made of nickel and cadmium.
 - It can perform at low temperatures.
 - Should be charged only on complete discharge. Otherwise its maximum energy capacity would lower upon each charge/discharge cycle. This is known a memory loss.
 - 500 charging cycles.
 - Tolerant of overcharging.
- > NIMH (Nickel Metal Hydride) is a rechargeable battery used primarily in portable computers.
 - Its capacity is 30% more than the NICAD.
 - These are less prone to memory loss.
 - Environment friendly.
 - Only 500 charge / discharge cycles.
 - Generate more heat during charge.
 - Have high self discharge.
- > A computer battery is directly soldered to the motherboard.
- Functions of a computer battery is to power an integrated chip called an RTC or real time clock which runs, whether the system is on or off.

- Life span of a computer battery varies from 2 to 10 years depending on ambient temperature, duration of time the computer is powered off and the type of motherboard the battery is attached to.
- CMOS (Complementary Metal Oxide Semiconductor) battery recharges itself whenever the computer is turned on.

CHAPTER-2 SOFTWARE CONCEPTS

Revision Notes

- Software represents the set of programs that govern the operations of a computer system and make the hardware run smoothly.
- Classification of Software:



- (i) System Software : These software are mandatory for all computer systems to work. For example: Operating Systems like Windows and language processors like assembler, etc.
- (ii) Application Software : These software are made to perform a specific task. For example: WordPad, MS-Word, etc.
- (iii) Utility Software : These software are used to perform some additional functions which makes our computer more safe, secure and work smoothly. These software are considered to be a part of system software. For example, antivirus, disk defragmenter, etc.

SYSTEM SOFTWARE

- (i) **Operating System :** An operating system is a system program that acts as an interface between user and the machine. It allocates and manages the resources of the computer.
- (ii) Language Translators are programs that are used to convert a program written in HLL or assembly language to machine language.
- (a) Compiler: A complier is a system program which translates a program written in a high level language into its equivalent program in machine language.

 $\begin{array}{ccc} \text{Source} \\ \text{program} \end{array} \rightarrow \qquad \text{Compiler} \rightarrow \end{array}$

(b) **Interpreter** : It converts a HLL program into equivalent machine language program one line at a time and executing it, if no error is encountered.

Code

Source				
program	\rightarrow	Interpreter	\rightarrow	Result

(c) Assembler: It can be defined as a system program than converts an assembly language program into the machine language of the host computer.

Assembly				Machine
lang. Program	\rightarrow	Assembler	\rightarrow	lang. Program

> UTILITY SOFTWARE

- (i) Antivirus : An antivirus is utility- software which detects and removes computer viruses. The antivirus keeps a watch on the functioning of the computer system.
- (ii) **Disk Defragmenter :** A disk defragmenter scans the hard disk for fragmented files and brings all the fragments together.
- (iii) **Backup Utility :** This utility is used to create the copy of the complete or partial data stored in a disk or CD on any other disk. In case the hard disk crashes or some other system failure occurs, the files can be restored using backup software.

- (iv) **Compression Utility**: This utility is used to compress large files. Compression is useful because it helps reduce resources usage and the file transmission on the network becomes easier.
- (v) **Device Drivers :** A device driver is a program that controls a particular type of device that is attached externally to a computer.
- (vi) **Disk Cleaner** : This utility scans for files that have not been accessed/used since long. Such files might be occupying huge amount of memory space. In that case, the Disk Cleaner utility prompts the user to delete such files so as to create more space on the disk.
- (vii) File Management Tools: This utility helps the user in storing, indexing, searching and sorting files and folders on the system. The most commonly used tool is the Windows Explorer and Google Desktop.

APPLICATION SOFTWARE

- (i) General Purpose Application Software : Some of the application software is made for the common users for day to day application and uses. The users may use them in the manner they want.
 - Word Processor : Word processor is a general purpose application software used to create documents. It allows us to create, edit and formal documents. Popular examples of Word processing software are Writer (Open Office) and Microsoft Word.
 - **Presentation Tools** : Presentation tools is a general purpose application software that lets us create presentations on any topic. We cannot only create a presentation and add slides but also can use different types of background, fonts, animations, audio, video, etc. We can add clip art and other graphics into our document. Even audio, video files can be added to the presentations. Popular examples of Presentation tools software are Impress (Open Office) and Microsoft Power Point.
 - **Spreadsheet Packages :** Spreadsheet is a general purpose application software that lets us create and store data in tabular form. Both text and numerical values can be entered in a spreadsheet. All common mathematical and statistical formulae can be used on the numeric data. Popular examples of Spreadsheet software are Calc (Open Office) and Microsoft Excel.
 - **Database Management System :** Database Management System is general purpose application software that lets us create computer programs that control the creation, maintenance, and the use of database for an organisation and its end users. We can not only store data but can also manage data in a database. Popular examples of Database Management System are Base (Open Office) and Microsoft Access.

(ii) Special - Purpose (customised software)

- Customised Software : Customised Software is one which is made as per the user's requirement. Such type of software is customer specific. It is made keeping in mind the individual needs of the user and so are also referred to as Domain Specific Tools. Such software cannot be installed and used by any other user/customer since the requirements may differ.
 - **Inventory Management System and Purchasing System :** Inventory Management System is generally used in departmental stores or other organisations to keep the record of the stock of all the physical resources. For Example, in a Computer store, it keeps record of the number of computers, printers, printing sheet, printer cartridge available. It also helps to place purchase orders, bills, invoices etc. Various reports as position of stock, sales made in a particular period, profit earned etc. can be generated.
 - School Management System : School Management System (sometimes called a School Information System or SIS) is a system that manages all the school's data in a single, integrated application. Having all of the information in a single system allows schools to more easily connect data together. For example, when viewing a student's record, the user can follow a link to the student's class, and from there a link to the student's teacher, and from there a link to the teacher's other classes, and so on,
 - **Payroll System** : Payroll Management System software is used by all modern organisations to keep track of employees of the organisation who receive wages or salary. All different payment amounts are calculated by the payroll software and the record is maintained. The software keeps track of personal records of employees viz. name, address, date of birth, qualification, date of joining etc. It also keeps track of professional record viz. allowances, perks, income tax, insurance etc. Different reports, pay slips etc can be generated through this software.
 - **Financial Accounting :** Financial Accounting System is used to prepare accounting information, maintain different accounts ledger, and account books. It also helps an organisation to make budget.
 - Hotel Management: Hotel Management software refers to management techniques used in the hotel sector These can include hotel administration, accounts, billing, marketing, housekeeping, front office or front desk, food and beverage management, catering and maintenance. Even advance bookings can be made through this software. Customers can have a look at the hotel and the rooms before making bookings. At any point of time the room availability, tariff for each type of room and even booking status can be checked.

- **Reservation System :** Reservation System is software used to book (reserve) air flights, railway seats, movie tickets, tables in a restaurant, etc. In the case of a booking system, the inputs are booking requests. The processing involves checking if bookings are possible, and if so making the bookings. The outputs are booking confirmations/rejections.
- Weather Forecasting system : This software makes it possible to forecast the weather for days and even months in advance. The detailed weather reports can also be generated.
- Open Source Software refers to those categories of software whose license does not impose much restrictions and conditions
- The software developers who support the open source concept feels that an application can be more useful and error free if the user can make changes in the program code as per their needs.

Know the Terms

- Data synchronisation utilities establish consistency among data from a source to a target data storage and vice versa,
- File synchronization utilities maintain consistency between two sources. They maybe used to create redundancy or backup copies but are also used to help users carry their digital music photos and video in their mobile devices.
- Freeware : It generally refers to the software which are available for use at no cost or for an optional fee to avail all the functions of the software.
- > Shareware : It is that software which is made available with a right to redistribute copies.
- > Proprietary Software : It is a software which is owned by an individual or a company.
- **OSS** : Open Source Software.

TOPIC-1

CHAPTER-3 MEMORY UNITS AND NUMBER SYSTEM



Numbers in Base and Binary Addition

- A set of values used to represent different quantities is known as number system.
- Relation between various number systems is given below:

Hexadecimal	Octal	Decimal	Binary
0	0	0	0000
1	1	1	0001
2	2	2	0010
3	3	3	0011
4	4	4	0100
5	5	5	0101
6	6	6	0110
7	7	7	0111
8	10	8	1000
9	11	9	1001
А	12	10	1010
В	13	11	1011
С	14	12	1100

D	15	13	1101
Е	16	14	1110
F	17	15	1111

> Remember the following table to perform binary addition.

0 + 0 = 0
0 + 1 = 1
1 + 0 = 1
1 + 1 = 10
1 + 1 + 1 = 11

> Binary numbers can be added column by column just like decimal numbers. e.g.



- Decimal (base 10): It is the way by which most human beings represent numbers. Decimal is sometimes abbreviated as dec.
- Decimal counting goes : 0,1,2, 3, 4, 5, 6, 7,8,9,10,11,12,13,14,15,16,17,18 and so on.
- > Binary (base 2) : It is the natural way by which most digital circuits represent and manipulate numbers.
- Binary counting goes :0,1,10,11,100,101,110,111,1000,1001,1010,1011,1100,1101,1110,1111,10000,10001 and so on.
- Octal (base 8): It was previously a popular choice for representing a digital circuit number in a form that is more compact than binary. Octal is sometimes abbreviated as oct.
- Octal counting goes: 0,1,2,3,4,5,6,7,10,11,12,13,14, 15, 16,17,20,21 and so on.
- Hexadecimal (base 16): It is currently the most popular choice for representing digital circuit numbers in a form that is more compact than binary.
- Hexadecimal counting goes : 0,1,2,3,4,5,6,7,8,9, A, B, C, D, E, F, 10,11,12 and so on.
- In every number system weight/ Value of each digit is expressed as the power of the corresponding base.
 Conversion:
 - **Decimal to Binary** : Repeatedly divide by 2 until quotient becomes 0 and record all the remainders. Last remainder is the MSB.
 - Binary to Decimal : Multiply each binary digit by its weight and add all the results.
 - Decimal to Octal : Repeatedly divide by 8 until quotient becomes 0. Record all the remainders. Last remainder becomes the MSB.
 - Octal to Binary : Convert each octal digit to its 3 bit binary equivalent and write those obtained values in place of the respective octal digit. eg; $(521)_8 \rightarrow ?$

$$=\frac{5}{101}\frac{2}{010}\frac{1}{001}$$

521_e = 101010001₂

• **Binary to Octal** : Starting from LSB of the binary number make groups of three bits each. Add as many zeros before MSB as are short from 3. Now convert each group of binary digit into its equivalent octal number and write the result that obtained in place of the corresponding group.

eg;
$$101101101_2 = ?8$$

 $\frac{101}{\uparrow} \frac{101}{\uparrow} \frac{101}{\uparrow} = 101101101_2 = 555_8$

- **Decimal to Hexadecimal :** Repeatedly divide the decimal number by 16, recording all the remainders, until quotient becomes 0. Now write all remainders in order starting from the last one.
- Hexadecimal to Decimal : Multiply each hex digit by its weight and add all the results.
- Hexadecimal to Binary : Process is same as that in Oct to binary except that now each Hex digit is converted to a 4 bit binary equivalent.

- eg; $4A5_{16} = ?_2$ 4 A 5 0100 1010 0101 $4A5_{16} = 010010100101_2$
- **Binary to Hexadecimal :** This is also same as Binary to octal conversion except that now binary number is divided into groups of 4 bits each.
- eg; $101100111001_2 = ?_6$

 $\frac{1011}{B} \frac{0011}{3} \frac{1001}{9}$ 101100111001₂ = B39₁₆

Know the Terms

- > Base: Number of distinct symbols that can be used to represent numbers in a number system is its base.
- LSD: Least significant digit is the digit which carries least weight (has the minimum value) in every number system.
- MSD: In every number system the digit of a number that carries maximum weight (has the highest value) is the most significant Digit.



Revision Notes

- > Integers may be represented in various ways in computers. These are
 - (a) Sign and magnitude representation
 - (b) One's complement, Two complement
- As we know that all digital computers store data consisting of digits, alphabets, symbols, etc. But this data is not stored in the form we entered but it is stored in the form of binary code. Each alphabet or digit or symbol have their unique binary code.
- Some of the main computer codes are:
 - (i) ASCII Code : It is acronym for the American Standard Code for Information Interchange. It is used in most microcomputers and minicomputers and in many mainframes. It is a 7-bit code so it has 2⁷ — 128 possible code groups.
 - (ii) ISCII Code : It is acronym for Indian Standard Code for Information Interchange. It is a 8-bit code so it has 2⁸ = 256 possible code groups. It retains all ASCII characters and offers coding for Indian characters also.
 - (iii)UNICODE : It is the new universal coding standard being adopted by all newer platforms. Unicode provides a unique number for every character, no matter what the platform or program or the language is.

Know the Terms

- Encoding Scheme: It refers to the way in which every character of the information is converted into machine understandable form.
- Code Space: It is the set of all the codes used by an encoding scheme to represent characters. It ranges from 0 to 2ⁿ-1 code where n is the number of bits used by that scheme.
- Code Point: It is the code for a single character; any scheme has total number of bits used to represent a single character in that particular encoding scheme.

Code Unit: It is the maximum number of bits used to represent a character in any encoding scheme.

Commonly Made Error

• Students gets confused between code space and total code points.

Answering Tip

• Remember Code space is a range from 0 to 2ⁿ-1 and total code points are equal to 2ⁿ. where n is code unit of that scheme.

CHAPTER-4

BOOLEAN ALGEBRA

Revision Notes

- Boolean algebra developed by George Boole in 1854 deals with binary values and logical operations and hence is also known as Binary Algebra or Logical Algebra. It helps us in analysing and simplifying the digital circuits It is also called Switching Algebra.
- A Boolean function is defined by a Boolean expression consisting of binary variables, constants 0 or 1 and logical operators. For example: A Boolean function F (A,B,C) can be defined as :

 $F(A,B,C) = A.B + B.C + \overline{A} \cdot \overline{C}$

Where LHS represents output Y of the logical expression. Hence, we can say $Y = A.B + B.C + \overline{A} \cdot \overline{C}$

- A Boolean expression is a logical expression that produces a Boolean value *i.e.*, true or false when evaluated.
- > Boolean Algebra uses three basic logical operators :-
 - **NOT operator** It operates on single input and gives complement of the input as output. It is represented by an over bar or apostrophe on the variable to be operated. Thus if A = 0, then A' = 1 and vice versa. Most programming languages use a '!' (exclamation sign) as NOT operator,
 - OR operator- It is a binary operator equivalent to a logical (+) addition. Thus A + B + C implies A OR B OR C. The operator gives a true (i.e. 1) if any of the operand is true or 1. In programming '||' (double pipe) is used as a symbol for OR operator.
 - AND operator- It is a binary operator equivalent to logical (.) multiplication. Thus A . B implies A AND B. It gives a true (i.e. 1) only if both the operands are true or 1. In programming '&&' (double ampersand) is used as a symbol for operator AND.
- A logical variable can take only two values i.e. either a binary 1 or a binary 0. Although, there can be infinite number of variables in a Boolean expression. While evaluating boolean expression the order of evaluation of logical operators is NOT AND then OR Parenthesis is evaluated first.
- Truth Table- It is tabulated form of all the possible input combinations and their respective outputs. The number of possible input combinations for a Boolean expression is 2ⁿ, where n is the number of input variables. Hence for a Boolean function F(A,B), number of possible combinations will be 2² i.e. 4 and for a Boolean function F(A,B,C,D) it will be 2⁴ i.e. 16.

For the function $F(A,B,C) = A.B + B.C + \overline{A}$. \overline{C} . there will be 8 possible combinations and hence 8 rows in the truth table as given below.

Α	В	С	A.B	B.C	\overline{A} . \overline{C}	Y
0	0	0	0	0	1	1
0	0	1	0	0	0	0
0	1	0	0	0	1	1
0	1	1	0	1	0	1
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	1	0	0	1
1	1	1	1	1	0	1

> Laws used in Boolean Algebra are summed up in the table given below

LAW	AND	OR
Commutative Law	A.B = B.A	A + B = B + A
Associative Law	A.(B.C) = (A.B).C	A + (B + C) = (A + B) + C
Distributive Law	A.(B + C) = A.B + A.C	A + (B.C) = (A + B).(A + C)
Identity Law	A.1 = A	A + 0 = A
Idempotent Law	A.A = A	A + A = A
Complement Law	$A.\overline{A} = 0$	$A + \overline{A} = 1$
Annulment Law	A.0 = 0	A + 1 = 1
DeMorgan's Law	$\overline{AB} = \overline{A} + \overline{B}$	$\overline{A + B} = \overline{A} \cdot \overline{B}$
Absorption Law	A.(A+B) = A	A + (A.B) = A
Double Negation or Inversion Law	$\overline{\overline{A}} = A$	

Logic Gate is simply an electronic circuit which takes one or more electronic signals as input to give an output.

NOT Gate is an inverter circuit that operates on single input. It gives complement of the input as the
output. It is represented by the following symbol.

• AND Gate gives a high output if both the inputs are high. Algebraically it is represented by a (.) dot. Its electronic symbol is

• OR Gate gives a high input if any one of the input is high. Its algebraic symbol is (+) Plus. and electronically it is represented as

$$A \longrightarrow OR A+B$$

• NAND Gate is inverter of AND gate. It gives a High Input if any of the inputs is low. Its symbol is AND Gate with a small circle at the output implying inversion.

• NOR Gate is inverter of OR. Its output is low if any of the inputs is high.

$$A \longrightarrow NOR O \overline{\overline{A+B}}$$

• XOR Gate gives a high output if either of the inputs is high i.e. odd number of inputs is high. It is used to detect the mismatch of bits. Its algebraic symbol is ⊕.

$$\begin{array}{c} A \\ B \end{array} \underbrace{) XOR}_{Q = A \oplus B \text{ or}} Q \\ Q = \overline{A} \cdot B + A \cdot \overline{B} \end{array}$$

• XNOR Gate gives a high output when both the inputs are same *i.e* either both are high or both are low.

$$A \longrightarrow XNOR O Y$$

$$Y = \underline{A} \odot B \text{ or}$$
$$Y = \overline{AB} + AB$$

> A combined Truth table for all the gates is given below

INP	UTS			OUT	PUTS		
Α	В	AND	NAND	OR	NOR	XOR	XNOR
0	0	0	1	0	1	0	1
0	1	0	1	1	0	1	0

1	0	0	1	1	0	1	0
1	1	1	0	1	0	0	1
NOT	GATE						
Α	Ā						
0	1						
1	0						

> **Tautology-** It is an expression or assertion that is always true.

► **Fallacy -** An expression that always yields a 0 or false is called Fallacy.

Basic Postulates of Boolean Logic

(i) If $x \neq 0$ then x = 1 and if $x \neq 1$ then x = 0(ii)Logical Addition (or relations)

0+0=0

$$0+1=1$$

1+0=11+1=1

(iii) Logical Multiplication (AND Relations)

0.0=
0.1=

(iv) Complement Rules

<u>0</u> = 1

- $\mathbf{1} = 0$
- Principle of Duality states that starting with a boolean relation, another boolean relation can be derived by
 Changing each OR sign (+) to an AND sign (.).
 - Changing each ON sign (1) to an AND sign (.).
 Changing each AND sign (.) to an OR sign (+).
 - 3. Replacing each 0 by 1 and each 0 by 1.
- > Theorems of Boolean Algebra
- Annulment Law A term AND ed with a "0" equals 0 or OR ed with a "1" will equal 1.
- ▶ **Identity Law** A term OR´ed with a "0" or AND´ed with a "1" will always equal that term.
- Idempotent Law An input that is AND 'ed or OR 'ed with itself is equal to that input.
- Complement Law A term AND ed with its complement equals "0" and a term OR ed with its complement equals "1".
- Commutative law It states that changing the sequence of the variables does not have any effect on the output of a logic circuit.
- Associative law This law states that the order in which the logic operations are performed is irrelevant as their effect is the same.
- > Distributive law Distributive law states the following condition. A.(B + C) = A.B + A.C

Absorption Law

$$X+(X.Y)=X$$
$$X.(X+Y)=X$$

- > Involution Law $\overline{X} = X$ also called double inversion law
- > De Morgan's Law I. $\overline{X+Y} = \overline{X}\overline{Y}$

$$\mathbf{I.} \ \overline{\mathbf{X} \cdot \mathbf{Y}} = \overline{\mathbf{X}} + \overline{\mathbf{Y}}$$

- Universal gates NAND and NOR gates are known as universal gates as any possible circuit can be built using these two gates.
- > The decision which result into either Yes (TRUE) or No (FALSE) is called a Binary Decision.
- > Value true and false are called Truth values.
- Statements which can be determined to be true or false are called logical statements truth functions and the results TRUE or FALSE are called Truth values.

Know the Terms

AND – OR - Invert Logic : When the output of an AND – OR circuit is complemented (inverted), it results in an AND – OR – Invert circuit.

- > AND OR Logic : AND OR circuit can have any number of AND gates each with any number of inputs.
- Exclusive NOR Logic : The exclusive NOR can be implemented by simply inverting the output of an exclusive OR (XNOR).
- Exclusive OR logic : This circuit is considered a type of logic gate with its own unique symbol it is actually a combination of two AND gates, one OR gate, and two inverters (NOT).
- NAND Gate : The NAND gate is a universal gate because it can be used to produce the NOT, the AND, the OR, and the NOR functions.
- NOR Gate : The NOR gate is a universal gate because it can be used to produce the NOT, AND, OR and NAND functions.

CHAPTER-5 COMPILER AND INTERPRETER

TOPIC-1 Understanding The Translation Process

Revision Notes

- Source code refers to the Original code written in a programming language by a programmer.
- Machine code refers to the code converted into a form that a computer can understand and can directly execute.
- > The special software that translates a source code into machine understandable form is known as the translator.
- Two types of translators are
 - 1. Compiler
 - 2. Interpreter
- > Compilation process undergoes following steps
 - 1. Preprocessing
 - 2. Compilation
 - > Analysis (Front End phase)
 - > Synthesis(Back End phase)
 - 3. Assembly
 - 4. Linking
 - 5. Loader
- Preprocessing phase removes extras (such as comments) from source code and adds all that is to be added / expanded so that code is completely ready for the next phase.
- > Analysis phase of compilation identifies all the tokens in the source code and creates a symbol table with it.
- > Synthesis phase passes the source code and generates syntax tree out of it.
- > The final product is an executable file (.exe file) which is the object code packaged with the Libraries.
- > The part of the compiler which performs the linking of libraries is called linker.
- > The Loader is a part of compiler that loads the computer executable module into memory for execution.
- A running program or the executing entity is called a process.
- > Interpreter analyses converts and runs one line of code and then moves on to next line.



TOPIC-2 Introduction to parallel and cloud computing

Revision Notes

The simultaneous working of a multiple processors to solve a computational problem is parallel computing.

- > Parallel computing may be achieved through.
 - a single computer with multiple processors / cores.
 - An arbitrary number of such computers connected by a network.
- > When a program is divided into independent units and these independents units are run as separate processes it is called threading.
- Cloud computing refers to storing and accessing data and programs over the Internet instead of your computer's hard drive.
- Clouds are of two types
 (i) Public cloud (ii) Private cloud
- > Public cloud refers to a common cloud service made available to multiple subscribers.
- > Organizations or individuals that use the same cloud are called Cloud "tenants."
- > A private cloud consists of computing resources exclusively owned by one business or organization.

CHAPTER-6 PROBLAM SOLVING TECHNIQUE

- > A software is developed in order to automate any daily life task that a human does.
- > To automate any task, precise step by step instructions are required to be given.
- > The success of any automated system depends on the precision of these instructions
- > Computerising any system requires a step by step approach.
- > This step by step approach to problem-solving is known as a problem solving cycle.
- ➢ Following are the steps of this cycle.
 - **Problem Analysis** involves identifying the problem and the input data and the output desired.
 - **Developing an algorithm** is the step where all the possible solutions to the problem are identified and the best out of these is represented as an algorithm in a natural language.
 - Coding is done using any of the programming languages based on the algorithm developed.
 - **Testing and debugging** is required to check if the developed system produces the required output and any errors found are removed.
- > In today's world of ever changing technology and user requirements, there is always a constant need for upgrading the system so all these steps are performed in cyclic order over the period.
- > Algorithm: a step by step sequence of performing a task is called algorithm.
 - Algorithm is required by a programmer to clearly visualize the instructions it require to code in order to develop a software. These also help him to identify the proper inputs and correct outputs.
 - A good algorithm must
 - Precisely describe the steps
 - Define the results of each step uniquely and ensure that result of each step depends purely on the inputs of that step or the output of the preceding steps.
 - Stop after a finite number of steps.
 - Receive some input
 - Produce some output.
 - Following are considered while writing an algorithm
 - Input
 - Processing to be done
 - Outputs
 - Two most common methods to represent an algorithm are
 - Pseudo code
 - Flowchart
 - Both these should
 - Clearly depict the logic of the solution.

• Show the flow of control during the program execution.

> Flowchart

- A flowchart is a pictorial representation of step by step solution of a problem.
- Symbols used in a flowchart are as follows:



- > **Pseudocode:** algorithms can also be represented using pseudocode. Instructions of a pseudocode cannot be executed directly by the computer, but can be easily understood by the programmer.
 - Pseudocode instructions are written using keywords of which some are given below
 - INPUT
 - PRINT
 - IF/ELSE
 - WHILE
 - TRUE/FALSE
 - COMPUTE/CALCULATE
 - DISPLAY
 - FOR
 - CASE
 - Advantages of a pseudocode
 - It improves the readability of the algorithm.
 - It can be used as a rough documentation for increased program understandability of programs by different programmers.
 - Coding becomes easy
 - Flow of Control is used to show the sequence or flow of events as will happen during program execution. This flow can be sequential or branch out based on a condition or even iterative.
 - **Sequential flow:** it has events occurring in a sequence one after the other without being dependent on any condition.
 - Selective flow: here the flow of control gets branched based on whether a particular condition evaluates to true or false.
 - Iterative flow: here a sequence of steps is performed iteratively until some condition is met.
- Verifying algorithm: any algorithm needs to be verified in terms of expected inputs and required outputs using dry run. In the due course the algorithm is verified and modified.
- Comparing algorithms: various approaches applied to solve a problem need to be compared to find out the best possible solution. For this algorithms are compared for their time and space complexity.
- Decomposition: is breaking a complex problem into multiple sub problems such that each sub problem can be examined and solved independently and combined later to arrive at the required system.

UNIT-II : COMPUTATIONAL THINKING AND PROGRAM-MING-I

CHAPTER-7 PYTHON FUNDAMENTALS

Revision Notes

- Python programming language was developed by Guido Van Rossum in Feb 1991. It was named after famous BBC comedy show Monty Python's Flying Circus.
- It is an easy to learn yet powerful object oriented programming language. It is a very high level programming language.
- > Variables are reserved memory locations to store values. A variable has a name and a value.
- Interactive mode of working means we type the command one command at a time, and the Python executes the given command there and then gives us output.
- > Interactive mode is used for testing code.
- > Script mode is useful for creating programs and then run the programs later and get complete output
- > Python is an interpreted language.

TOPIC-1

> Python's interactive interpreter is also called Python shell.

CHAPTER-8 DATA HANDLING



Data Types & Operators

- Integers are whole numbers. There are three types of integers in Python: (a) Plain, (b) Long, (c) Booleans
 (a) Plain Integers use 4 bytes to store a value these can be both positive and negative.
 - (b) Long integers are larger then integers and can store a number as large as the available memory of the machine. Suffixing any number with L makes it a long integer *e.g.* 90 L.
 - (c) Booleans represents truth values False and True and behave like the values 0 and 1.
- Float or floating point numbers are numbers having a fractional part. They represent numbers with 15 digit precision.
- Complex Numbers are represented as A+ Bj Where A is the real part and B is the imaginary part and both are represented as floating point numbers.
- There are two types of strings in Python: (a) ASCII / Normal Strings, (b) Unicode Strings
 (a) ASCII strings are represented between two quotations marks.
 - (b) Unicode strings are represented as normal strings prefixed with the letter u. *e.g.* u'अभय', $u'\lambda'$.
- List represents a list of values of any data type separated by commas and enclosed in a square bracket. These are mutable.
- > Tuples are lists that cannot be changed and represents comma- separated values within paranthesis.
- Dictionary represents a set of key values pair within curly braces i.e. { }, separated by a comma and all the keys being unique.
- Mutable data types can change their values in place e.g. Lists and dictionaries.
- > Three key attributes associated with any Python object are:
 - (a) The type that defines the operations that can be performed on an object. type () returns the type of an object.
 - (b) The value of an object is the data item in the object. print statement is used to display the value of an object.
 - (c) id of an object is the memory location of the object. id () returns the id of an object.

- > An expression is a combination of operators, literals and variables.
- > A compound expression contains multiple types of operators.
- > An expression in python can be one of the following types.
 - (a) Arithmetic expression that involves numbers and arithmetic operators.
 - (b) Logical expression has literal and/ or variables and logical operators.
 - (c) String expression contains string operators (+,*) along with string operands and integers.
 - + with string acts as concatenation operator for two strings.
 - * with a string and one integer acts as a replication operator.
- In a mixed arithmetic expression python converts all operands type to the highest data type among the operands. This is called implicit type conversion or coercion.
- When a user explicitly converts data type of a variable it is called type casting. Syntax <data type> (expression)
- ▶ When evaluating chained relational expressions such as a < b < c Python treats it is a < b & b < c.
- Data type is a set of values and the allowable operations on those values. Python has a great set of useful data types. Python's data types are built in the core of the language. They are easy to use and straightforward.



- > Numbers can be either integers or floating point numbers.
- A sequence is an ordered collection of items, indexed by integers starting from 0. Sequences can be grouped into strings, tuples and lists.
 - Strings are single line text that can contain any characters. They can be declared with single or double quotes.
 - Lists are used to group other data. They are similar to arrays.
 - A **tuple** consists of a number of values separated by commas.
- > A set is an unordered collection with no duplicate items.
- > A **dictionary** is an unordered set of key:value pairs where the keys are unique

Data type conversions

There are several built-in functions to perform conversions from one type to another.

Function	Description
int(x [,base])	Converts x to an integer. base specifies the base if x is a string.
lon <mark>g(x [,base]</mark>)	Converts x to a long integer. base specifies the base if x is a string.
float(x)	Converts x to a floating-point number.
complex(real [,imag])	Creates a complex number.
str(x)	Converts object x to a string representation.
repr(x)	Converts object x to an expression string.
eval(str)	Evaluates a string and returns an object.
tuple(s)	Converts s to a tuple.
list(s)	Converts s to a list.
set(s)	Converts s to a set.
dict(d)	Creates a dictionary. d must be a sequence of (key,value) tuples.
frozenset(s)	Converts s to a frozen set.
chr(x)	Converts an integer to a character.
unichr(x)	Converts an integer to a Unicode character.
ord(x)	Converts a single character to its integer value.
hex(x)	Converts an integer to a hexadecimal string.
oct(x)	Converts an integer to an octal string.

> An **implicit** type conversion is a conversion performed by the compiler without programmer's intervention.

An explicit type conversion (type promotion), is done by Python where it converts all the operands to the largest operand.

Example: a,b=3,5

- $c = a/b \rightarrow c$ will always have floating point result.
- > Operators are special symbols which perform some computation. Operators and operands form an expression.
- > Python operators can be classified as given below.



Arithmetical Operators

• Arithmetic operators help us to perform various arithmetic calculations. The arithmetic operators are explained in the table below. Let's assume value of a=2 and b=3

Operator	Description	Example
+	Addition - Adds values on either side of the operator	a + b results in 5
-	Subtraction - Subtracts right hand operand from left hand operand	a –b results in -1
*	Multiplication - Multiplies values on either side of the operator	a * b results in 6
/	Division - Divides left hand operand by right hand operand	a/b results in 0
%	Modulus - Divides left hand operand by right hand operand and returns remainder	a %b results in 2
**	Exponent - Performs exponential (power) calculation on operators	a**b results in 8
11	Floor Division - The division of operands where the result is the quotient in which the digits after the decimal point are removed.	11//2 results in 5 11.0//2.0 results in 5.0

Relational/Comparison Operators

• These operators help us to make decisions based on certain conditions.

Operator	Description	Example
= =	Checks if the value of two operands are equal or not, if yes then condition becomes true.	(a == b) is not true.
!=	Checks if the values of two operands are equal or not, if values are not equal then condition becomes true.	(a != b) is true.
< >	Checks if the value of two operands are equal or not, if values are not equal then condition becomes true.	(a <> b) is true. This is similar to != operator.
>	Checks if the value of left operand is greater than the value of right operand, if yes then condition becomes true.	(a > b) is not true.
<	Checks if the value of left operand is less than the value of right operand, if yes then condition becomes true.	(a < b) is true.
>=	Checks if the value of left operand is greater than or equal to the value of right operand, if yes then condition becomes true.	(a > = b) is not true.

Operator	Description	Example
<=	Checks if the value of left operand is less than or equal to the value of right operand, if yes then condition becomes true.	(a <= b) is true.

Assignment Operators

• These operators assign the right side value to the left side variable.

Operator	Description	Example
=	Simple assignment operator, Assigns values from right side operands to left side operand	c = a + b will assign the value of $a + b$ into c
+=	Add AND assignment operator, It adds right operand to the left operand and assign the result to left operand	c += a is equivalent to c = c + a
-=	Subtract AND assignment operator, It subtracts right operand from the left operand and assign the result to left operand	c = a is equivalent to c = c - a
*=	Multiply AND assignment operator, It multiplies right operand with the left operand and assign the result to left operand	c *= a is equivalent to c = c * a
/=	Divide AND assignment operator, It divides left operand with the right operand and assign the result to left operand	c = a is equivalent to c = $c a$
%=	Modulus AND assignment operator, It takes modulus using two operands and assign the result to left operand	c % = a is equivalent to c = c % a
=	Exponent AND assignment operator, Performs exponential (power) calculation on operators and assign value to the left operand	$c^{} = a$ is equivalent to $c = c^{**} a$
//=	Floor Division AND assigns a value, Performs floor division on operators and assign value to the left operand	$c \parallel = a$ is equivalent to $c = c \parallel a$
vise operators		

Bitwise operators ≻

> Bitwise operator works on bits and perform bit by bit operation. Assume if a = 65; and b = 12; Now in ٠ binary format they will be as follows:

$$\begin{array}{l} a &= 0100\ 0001 \\ b &= 0000\ 1100 \\ a\&b &= 0000\ 0000 \\ a|b &= 0100\ 1101 \\ a^b &= 0100\ 1101 \\ \sim a &= 1011\ 1110 \end{array}$$

• The table below lists the bitwise operators in Python. Let's assume a=65 and b=12 for this example.

Operator	Description	Example
&	Binary AND Operator copies a bit to the result if it exists in both operands.	(a & b) results in 0 (0000 0000)
	Binary OR Operator copies a bit if it exists in either operand.	(a b) results in 77 which is 1001101
^	Binary XOR Operator copies the bit if it is set in one operand but not both.	(a ^ b) results in 77 which is 1001101
~	Binary Ones Complement Operator is unary and has the effect of 'flipping' bits.	(~a) results in -66 which is 10111110.
<<	Binary Left Shift Operator. The left operands value is moved left by the number of bits specified by the right operand.	a << 2 results in 260 which is 100000100
>>	Binary Right Shift Operator. The left operands value is moved right by the number of bits specified by the right operand.	a >> 2 results in 16 which is 10000

> Logical Operators

• There are following logical operators supported by Python language.

Operator	Description	Example
AND	Logical AND operator. If both the operands are true then condition	a=5b=10
	becomes true.	(a and b) is true.

OR	Logical OR Operator. If any of the two operands are non zero then condition becomes true.	(a or b) is true.
NOT	Logical NOT Operator. Use to the logical state of its operand. If a condi- tion is true then Logical NOT operator will make false.	not(a) is false.

> Membership Operators

• Python has membership operators, which test for membership in a sequence, such as strings, lists, or tuples. There are two membership operators explained below:

Operator	Description	Example
In	Evaluates to true if it finds a variable in the specified sequence and false otherwise.	y = [] If x in y: return 1 if x is a member of sequence y.
not in	Evaluates to true if it does not finds a variable in the specified sequence and false otherwise.	Y = [] If x not in y: here not in results in a 1 if x is not a member of sequence y.

Identity Operators

 Identity operators compare the memory locations of two objects. There are two Identity operators explained below:

Operator	Description	Example
is	Evaluates to true if the variables on either side of the	x is y, here is results in 1 if
	operator point to the same object and false otherwise.	id(x) equals id(y).
is not	Evaluates to false if the variables on either side of the	x is not y, here is not results in
	operator point to the same object and true otherwise.	1 if id(x) is not equal to id(y).

> Operator precedence

• The following table lists all operators from highest precedence to lowest.

Operator	Description
**	Exponentiation (raise to the power)
~ + -	Complement, unary plus and minus (method names for the last two are +a and -a)
* / % //	Multiply, divide, modulo and floor division
+ -	Addition and subtraction
>> <<	Right and left bitwise shift
&	Bitwise 'AND'
^	Bitwise exclusive `OR' and regular `OR'
<= < > >=	Comparison operators
<> == !=	Equality operators
=% = /= //=	Assignment operators
-= += *= **=	
is , is not	Identity operators
in not in	Membership operators
not or and	Logical operators

TOPIC-2 Execution of a program: Types of errors

- ➤ A bug is an error in the code.
- > Three types of errors can occur compile the errors, run-time errors and logical errors.

- > Compile time error occur at the time of program compilation.
- > Compile time errors can syntax errors or semantic errors.
- > Run time errors occur during the execution of a program and are also known as exceptions.
- Logical errors occur when a desired result is not obtained from a program. This is due to some mistake in the program logic.
- > Debugging is the process of finding errors in a program.
- > Python pdb module is an interactive source code debugger.

CHAPTER-9 CONDITIONAL AND LOOPING CONSTRUCTS

Revision Notes

- **Flow of Control:** It is the order of execution of various statements written in a program.
- > The control and flow of the program can be divided into:
 - Sequence When the statements are executed in a sequence one after the other.
 - Selection/Conditional/Decision When the statements are executed depending on the validation of the condition.
 - Iteration/Looping When a given set of statements are executed more than once due to presence of a loop.
- > Types of Selection statements:
 - if statement
 - simplest form of if statement
 - Syntax
 - if condition:

set of statements

- the set of statements will be executed only if the condition is true.
- the set of statements can have any number of statements.
- if-else statement
 - allows two different sets of statements to be executed upon satisfaction or non-satisfaction of the test condition
 - Syntax
 - if condition:

set1 of statements

else:

set2 of statements

- the set1 of statements will be executed if the condition tested is true.
- the set2 of statements will be executed if the condition tested is false.

setN of statements

- the two sets of statements can have any number of statements
- if-elif-else
 - allows simultaneous testing of more than one conditions and also allows different sets of statements to be executed upon satisfaction or non-satisfaction of the test condition.
 - Syntax

```
if condition1:

set1 of statements

elif condition2:

elif condition3:

elif condition4:

set3 of statements

elif condition4:

set4 of statements

:

else:
```

24 1

- the set1 of statements will be executed if test condition1 is true. In case, condition 1 is false, then program flow will move to elif and tests condition 2.
- the set2 of statements will be executed if test condition2 is true. In case, condition 2 is false, then program
 flow will move to next elif and tests condition 3.
- the set3 of statements will be executed if test condition3 is true. In case, condition 3 is false, then program flow will move to next elif and tests condition 4.
- the set4 of statements will be executed if test condition4 is true. In case, condition 4 is false, then program flow will move to next elif and tests the next condition.
- When all the conditions are false, the program flow will move to the else and its corresponding set of statements will be executed.

Nested if-else statement :

- allows a conditional statement inside another conditional statement such as *if* or *else* or *elif* statement inside another *if* or *else* statement.
- Syntax

if condition1:

set1 of statements if condition11:

set11 of statements

elif condition12:

set12 of statements

else:

set13 of statements

elif condition2:

set2 of statements

else:

else:

set3 of statements

Types of Looping statements:

- for loop / definite loop :
 - used to repeat the set of instructions over a defined range of values.
 - the condition for execution of loop is checked after every repetition.
 - else statements is executed when the control exits the for loop.
 - Syntax

for <Control_variable> in <range of values>: set1 of statements

set2 of statements

- range() function used to create a list of values to be taken by loop with a start, stop and increment (optional) value. Syntax: range (start, stop[, increment])
- while loop / indefinite loop
 - use to repeat the set of instructions till the test condition is true.
 - the condition for execution of loop is checked after every repetition.
 - else statements is executed when the condition becomes false.
 - Syntax:

while <condition>:

set1 of statements

else:

set2 of statements

- Infinite loop : It is a loop in which the test condition can never become false.
- **Nested loop**: When one loop is placed inside another loop. First, the condition of outer loop is tested, if it is true then condition of inner loop will be tested.

• Syntax of nested while loop

while condition :

while condition :

set1 of statements

set2 of statements

set3 of statements

• Syntax of nested for loop

for <Control_variable1> in < range of values>:

for <Control_variable2> in < range of values>:

set1 of statements

set2 of statements

set3 of statements

- Jump statements: These statements are used to take the control of the program out of the loop even if the test condition is still true.
- > Types of jump statements:
 - **Break statement** It is used to stop execution of the loop immediately and transfer the flow of control to the statement immediately after the loop.

Syntax

break

• **Continue statement** – It is used to stop execution of the loop immediately and transfer the flow of control to the beginning of the loop again.

Syntax

continue

• Pass statement - It is used to define a statement body with no statements and that does nothing.

Syntax

pass

CHAPTER-10 STRING MANIPULATION

Revision Notes

- > The language creates a structure that holds the individual characters together.
- > String is a consecutive sequence of characters which are enclosed in single quotes (' ') or double quotes (" ").
- > An **Empty String** is a string that has no characters.
- > Quotes can be inserted inside a string by placing \ before opening and closing quotes.
- \rightarrow **n** is used to display the output on the next line of the screen.
- \succ **t** is used to tabulate the output.
- > Multiline strings are represented by enclosing the text in triple quotes ("' "').
- > Traversing a string means accessing all the elements of a string.
- Each character in a string has an index value.
- > Individual elements of a string can be accessed by enclosing index value in [].
- > Using float or other types for index results in TypeError.
- > Left index of a string starts from 0 and right index starts from -1.
- > Each character of a string can be accessed using for loop.

Syntax: for i in string_name:

print(i)

- String operators
 - **Concatenation** Creating a new string by adding two strings using +.

Syntax: string3 = 'string1' + 'string2'

• **Replication** –Repeating a string from multiple copies of same string using *.

Syntax: string2 = integer * 'string1'

- Membership Checks whether a particular character exists in a string or not using 'in' or 'not in'.
 Syntax: <substring> in/not in <string1>
- Comparison Compares two strings on the basis of ASCII value of the characters using <, >, <=, >=, =
 =, !=.

Syntax: string1 <= string2

> Slicing – Retrieves a subset of the string.

Syntax: string_name [start:end]

Content of the strings cannot be changed after creation. Modifying contents of string by replacing / deleting/ adding a character shows TypeError.

Functions in strings

• **len**() – Returns the length of the string.

Syntax: len(string_name)

capitalize() –Returns copy of the string with first letter in uppercase.

Syntax: string_name.capitalize()

• split() -Breaks a string into substrings at the specified place.

Syntax: string_name.split([separator [, maxsplit]])

- replace() Replaces all occurrences of the old string with the new string.
 Syntax: string_name.replace(old string, new string)
- > Slicing means taking out a substring from a string.
- There are two ways to slice a string.
 - Using the slice() constructor
 - Syntax: slice(start, stop, step) or slice(stop)
 - Extending indexing can be used in place of the slice object.

Syntax: string [start:end:step]

replace() is used to replace all occurrences of a sequence of characters or a character with some other sequence of characters or character within a string.

Syntax: string.replace(old,new[,max])

> isalnum() returns true if all the characters of the string are alphanumeric.

Syntax: string.isalnum()

> isalpha() returns true if string contains only alphabet.

Syntax: string.isalpha()

> isdigit() returns true if string contains only digits and false otherwise.

Syntax: string.isdigit()

> islower() returns true if all the letters that the string contains are in lower case.

Syntax: string.islower()

isupper() returns true if all the letters that the string contains are in upper case.
 Syntax: string.isupper ()

> isspace() returns true if string contains only whitespace characters.

Syntax: string.isspace()

> lower() converts all uppercase characters in a string to lower case.

Syntax: string.lower()

> upper() converts all lowercase characters in a string to uppercase.

Syntax: string.upper()

title() returns a copy of the sting in title case.

```
Syntax: string.title()
```

Istrip() returns a string with all the leading whitespaces(default) removed. Can also be used to remove any other leading character.

Syntax: string.lstrip([chars])

rstrip() returns a string with all the trailing whitespaces(default) removed. Can also be used to remove any other trailing character.

Syntax: string.rstrip([chars])

strip() returns a string with all the leading and trailing whitespaces(default) removed. Can also be used to remove any other leading and trailing character.

Syntax: string.strip([chars])

count() returns the number of occurrences of a string in the given string, counting from the start position till the end position if specified.

Syntax: string.count(substr, start =0 , end=len(string))

find() returns the index if a string occurs in the given string, counting from the start position till the end position if specified. If no occurrence is found it returns -1.

Syntax: string.find(substr, start=0, end =len(string))

- > index() is same as find() except that it raises an error if the string is not found.
- > partition() searches for a string in the given string and returns a tuple containing three elements vice
 - 1. The part of the string before the string to be searched.
 - 2. The search string.
 - 3. Part of the string after the search string.

CHAPTER-11 LISTS

Revision Notes

- > Sequence is an object that contains multiple items of data.
- > Items are stored in a sequence one after another.
- > Sequence may have repeated items in a list.
- > The number of elements is called **length** of the sequence.
- > Various sequences available in Python are:
 - Lists
 - Strings
 - Dictionaries
 - Tuples
 - Sets

LISTS

List is a collection of values like series or an ordered sequence of values.

28 1

- > The items in a list can be of any type such as string, integer, float, object, etc.
- > Elements of a list are depicted in square brackets [], separated by commas.
- > Values in the list can be modified in place because it is mutable.
- > The values that make up a list are called its **elements**.
- Syntax for creating a list:

<list_name> = []

> A list with blank or no values is called an **empty list**.

> Creating a list from an existing sequence:

- Creating a list from a sequence
 - <new_list_name> = list (sequence)
- Creating an empty list
 - list_name = list()
- > List can also be created through user input
- > List index can be a positive or negative integer value.
- > An IndexError appears if the user tries and accesses elements that do not exist in the list.
- > Traversing a list means accessing each element of a list.
 - Using 'in' operator

for i in <list_name>

print (i)

- Using range() function
 - for i in range(len<list_name>):
 - print (list_name[i])
- > If we assign the elements of one list to another list, both shall refer to the same object.
- > Changes made with one alias get reflected in the other alias.
- > In Python, while comparing two lists, each element is individually compared in lexicographical order.
- > Two lists can be compared if they are of comparable type, otherwise Python flashes an error.
- > Operations on Lists:
 - Concatenation A process in which multiple lists can be combined together with the help of certain operators using '+'.

Syntax:

list3 = list1 + list2

• Replication - A process in which a list gets replicated or repeated a specific number of times using '*'.

Syntax:

list1 * 3

- We cannot multiply two lists
- **Membership Testing** An operation carried out to check whether a particular element is a member of that list or not.
 - Using 'in' operator returns "True" if the element appears in the list, otherwise returns "False".
 - Using 'not in' operator returns "True" if the element does not appear in the list, otherwise returns "False".

Syntax:

print (<element> in/not in <list1>)

- Indexing An index value is assigned for each item present in the sequence.
 - In Python, indexing starts from 0.
 - Negative indices identify positions from the end of the list.
 - Slicing It is an operation in which the user can slice a particular range from that sequence.
 - List slices are sub-part of a list extracted out.

Syntax:

list1 [start: stop: step]

> Built-in Functions for lists:

• append() – Adds a single item to the end of the list and does not create a new list.

Syntax:

list1.append(item)

• extend() – Adds one list at the end of the other list.

Syntax:

list1.extend(list2)

• **insert()** – Inserts an element at a specified index.

Syntax:

list1.insert(index_number, value)

• reverse() – Reverses the order of the elements in a list.

Syntax:

list.reverse()

• index() – Returns the index of first matched item from the list.

Syntax:

list.index(<item>)

• update() – Changes an item or a range of items using '='

Syntax:

list[index] = <new value>

• len() – Returns the length of the list.

Syntax:

len(list)

sort() – Sorts the items of the list in place.

For ascending order

Syntax:

list.sort()

For descending order

Syntax:

list.sort(reverse = True)

• clear() – Removes all items from the list.

Syntax:

list.clear()

• **count()** – **Counts** how many times an element has occurred in a list and returns it.

Syntax:

list.count(element)

- > **Deletion operation** For deleting an item from a list.
 - If index is known
 - pop() Removes the element from specified index and returns the removed element. Syntax:

list pop(ind

list.pop(index)

If no index value is provided, the last element in the list is removed.

 del statement – Removes the specified element but does not return the removed element. Syntax:

```
del list(index)
```

- to delete single element

- OR del list(start index : stop index) to delete a range of elements
- If element is known but its index is not known
 - remove()
 - Syntax:
 - list.remove(element)

30]

- Searching the list
 - For a particular element / index index()
 - Syntax:

list.index(element)

• For the maximum value in the list – **max()**

Syntax:

max(list)

• For the minimum value in the list – **min()**

Syntax:

min(list)

- > A list that contains another list as element is known as nested list.
- > Individual items in a nested list can accessed using multiple indexes.
- list() is used to create a list or to make copy of a list.
- ➤ sum() adds up all the elements of a list.
- > mean() is used to calculate mean of a given list of numbers.
- Linear search on a list can be performed by checking each element staring from index 0 and continuing the search until the number is found.
- Frequency of elements of a list can be found using collections.counter(); it returns a dictionary with elements of list as key and frequency as values element.

CHAPTER-12 TUPLES

Revision Notes

- > A tuple consists of group of values separated by commas.
- > Element of Tuples are depicted enclosed within parentheses ().
- > The values that make up a tuple are called its elements.
- > Elements in a tuple need not be of the same type.
- > The index value of tuple starts with 0.
- > Tuples are faster and more efficient than lists.
- If a tuple comprises of a single element, the element should be followed by a comma. Such a tuple is called a singleton tuple.

Creating tuple with a single element:

Syntax:

tuple_name = ("January",)

```
OR tuple_name = tuple()
```

- > A tuple can be created by accepting input by user input using *while* loop.
- > Tuples can be nested. This means that tuples can be placed inside other tuples.
- > The individual elements of a tuple can be accessed through their indices given in square brackets [].
- ➤ A tuple can be traversed using
 - 'in' operator with *for* loop.

Syntax:

for i in tuple_name:

print(i)

• range() function

Syntax:

for i in range(len (tuple_name)): print(tuple_name [i])

Slicing is used to retrieve a subset of values.

Syntax:

tuple_name[start: stop: step]

- > Two tuples can be combine together using '+' operator.
- > The elements of a tuple can be repeated using '*' operator.
- > The users can check whether a particular element is a member of that tuple or not.
 - Using 'in' operator returns "True" if the element appears in the tuple, otherwise returns "False".
 - Using 'not in' operator returns "True" if the element does not appear in the tuple, otherwise returns "False".

Syntax:

<element> in/not in <tuple_name>

> Tuple functions:

• len() – Returns the length of a tuple.

Syntax:

len(tuple_name)

count() – Counts the occurrence of an item in the tuple.

Syntax:

tuple_name.count(element)

• any() - Returns True if a tuple is having at least one item and returns False if the tuple is empty.

Syntax:

any(tuple_name)

• max() – Returns the element with maximum ASCII value in the tuple.

Syntax:

max(tuple_name)

• min() – Returns the element with minimum ASCII value in the tuple.

Syntax:

min(tuple_name)

sorted() – Sorts the elements of a tuple.

Syntax:

sorted(tuple_name)

• **index()** – Finds the first index of a given item and returns the index.

Syntax:

tuple_name.index(value, start, end)

- > Tuples can be compared using comparison operators like \langle , \rangle , = =, !=, etc.
- In Python, comparison operators start by comparing the first element from each sequence. If they are equal, it goes on to the next element until it finds the elements that differ. The subsequent elements are not considered.
- > A tuple is deleted using del statement.

Syntax:

del tuple_name

- A tuple can contain other compound objects such as lists, dictionaries and even another tuple. A tuple that contains another tuple as an element is known as a nested tuple.
- Each of the member tuple is treated as a single element for the main tuple.e.g. The tuple (1, 2, ('A', 'B', 'C'), 3, ('D', 'E')) has 5 elements.
- > Tuple () is used to create a tuple.
- > Sum () finds sum of all the elements of a tuple containing numbers.

CHAPTER-13 DICTIONARIES

Revision Notes

- > Python Dictionary is an unordered collection of items where each item is a key-value pair.
- A dictionary can be created by placing items inside curly braces { } separated by a comma. Syntax:

<dictionary_name>={'key1':'value1', 'key2':'value2',..., 'keyn':'valuen'}

- > To access elements in a dictionary, square brackets [] alongwith the key are used.
- > Traversing a dictionary means accessing each element of a dictionary.

Syntax:

for i in dictionary_name:

print(i, ':', dictionary_name[i])

> To add new elements to an existing dictionary

Syntax:

dictionary_name ['key'] = 'value'

To modify existing key-value pair in a dictionary Syntax:

dictionary_name ['key'] = 'value'

To merge two dictionaries

Syntax:

≻

 \geq

dictionary_name.update(dictionary2)

• When two dictionaries are merged, the values of the same key are overwritten.

> To remove an item from the dictionary

• Using del command

Syntax:

del dictionary_name[key]

Using pop() method

Syntax:

dictionary_name.pop(key)

- The users can check whether a particular key is present in a dictionary or not.
- Using 'in' operator returns "True" if the key is present in the dictionary, otherwise returns "False".
- Using 'not in' operator returns "True" if the key is not present in the dictionary, otherwise returns "False". Syntax:

<key> in/not in <dictionary_name>

Dictionary functions:

len() – Returns the number of key-value pairs in the dictionary.

Syntax:

len(dictionary_name)

• **clear()** – Removes all items from the dictionary.

Syntax:

dictionary_name.clear()

• get() – Returns the value of a given key in the dictionary.

Syntax:

dictionary_name.get(key)

• items() – Returns all the key-value pairs in the dictionary.

Syntax:

dictionary_name.items()

• keys() – Returns the list of keys used in the dictionary.

Syntax:

dictionary_name.keys()

values() – Returns the list of values defined in the dictionary.

Syntax:

dictionary_name.values()

- dict() function creates a dictionary.
- > del removes keys from a dictionary.
- > fromkeys() creates a new dictionary from the given sequence of elements.

Syntax:

dict.fromkeys(sequence[,value]).

It returns a new dictionary.

- if value specified in the fromkey() is a mutable object(list etc) then on its updating each element of the sequence is updated.
- > copy() method is used to create a shallow copy of a dictionary.

Syntax:

dict1=dict2.copy()

- If values associated with dictionary keys are iterable objects, then if the dictionary is modified the other one will too be modified.
- popitem() removes the last inserted item from dictionary and returns it as a tuple. It raises a keyerror if dictionary is empty.
- > setdefault() returns the value of a key. If the key is not present it is inserted to the dictionary.
- > max() with dict.get is used to find the key with maximum value in a dictionary.

Syntax:

max(iterable, key =dict.get)

> max() and dict.values() is used to find the maximum value in a dictionary.

Syntax:

max(dict.values())

- > min() together with dict.values() is used to find the minimum value in a dictionary.
- > sorted() returns the sorted list of keys in a dictionary.

UNIT-III : SOCIETY, LAW AND ETHICS-CYBER SAFETY

CHAPTER-14 SOCIETY, LAW AND ETHICS



Revision Notes

> Tips for safely browsing the Internet:

- Update the software regularly.
- Keep the web browser protected.
- Observe safe online behaviour.
- Use strong and unique passwords.
- Download only trusted files and applications.
- Do net get lured with impossible offers.
- Handle online transactions carefully.

- Make payments through secured connections.
- Use ad blocker.
- Beware of cookies. Cookies are small text files on the computer storing small pieces of information related to online habits of the user.
- Always bookmark important sites.
- Choose for private browsing through Incognito browsing, Proxy and Virtual Private Network (VPN).
- > Cyber safety refers to the safe and responsible use of information and communication technology.
- > Identity theft is a type of fraud that involutes using someone else's identity to steal money or gain other benefits.
- > Whenever a user visits a website, the browser may reveal the location via the device's IP address.
- > Browsers also provide search and browsing history.
- > Websites track their visitors through:
 - **IP Address:** It is a device's unique address to connect to the Internet. From this IP Address, a website can determine the rough geographical location of the device.
 - Cookies : These are small pieces of information websites can store in the browser.
 - HTTP Referer is a link on a web page to outside website. It automatically provides the visitor's information, such as IP address, location, web browser, machine type, etc. to the linked website.
 - Super cookies are persistent cookies that come back even after being deleted.
 - **User Agent** is a string or a line of text, that browser sends to every website, a device connects to. It tells the web server about the web browser and the OS being used.
- Anonymous browsers allow users to view websites without revealing any personal information of the user like their IP address, machine type, location etc.
- > Confidentiality of Information ensures that only authorize users get access to sensitive and protected data.
- > Confidentiality of information is maintained by:
 - (a) Encryption of data.
 - (b) Use of firewall
 - (c) Private browsing
 - (d) Accessing safe sites
 - (e) Carefully handling e-mails
 - (f) Avoiding use of public network.
- Cybercrime is a criminal act facilitated by use of electronic gadgets and information systems through internet. Cyber criminals are also called hackers.
- Some common cybercrimes are:
 - (a) Cyber Trolls These are the persons who start quarrels on the internet to distract a community and provoking the readers to behave emotionally.
 - (b) Cyber Bullying This is the attack upon an individual through electronic means to abuse or intimidate others.
 - (c) Cyber Stalking It is the use of internet to harass an individual or an organisation.
 - (d) **Spreading Rumors -** This is the act of creating fake e-mail IDs, masking actual identification and posting false information on social media.
- Cyber Forensics It is an electronic discovery technique used to determine and reveal technical criminal evidence.
- The Information Technology Act, 2000 or IT Act, 2000 is the primary law in India dealing with cybercrime and electronic commerce.



- > Social Media refers to web and mobile technologies that people use to share content and experience online.
- A social networking site is an application or online platform that allows users to create a public profile and interact with other users on the website.

- > Online friends are the connections that are made online.
- Facebook : It is a platform that allows people to share information in the form of posts, photos, videos, etc. in an easy and entertaining way. Users can also post comments and like posts shared by their friends.
- Twitter :It is a microblogging site where people communicate in short messages called tweets. The character limit for there twitter is 280 characters (It was 140 characters earlier).
- LinkedIn is a social networking site for the professionals where they can create and upload their resumes or other work and experience related information.
- YouTube is a video-sharing service users can watch, like and comment on videos and also upload their own videos.
- > Blogs or Weblogs are online journals displaying information in reverse chronological order.
- > Instagram is most popular social networking site for sharing photos and short videos.
- Whatever one does online, leaves a permanent footprint storing trails of his /her online activities, This is digital footprint or digital tattoos.
- Privacy Setting control:
 - (a) who all can see your posts.
 - (b) who can send request to you.
 - (c) what post of your personal info is visible to others.

Do's and Dont's of Social Networking:

- Do not post personal information.
- Do not give your password to anyone except your parents/guardians.
- Delete unwanted messages.
- Take care while sharing posts.
- Update privacy settings on social media.
- Respect privacy of others.
- Update your software.
- Be aware of spams.
- Take caution for cyber bullying.
- Control the troll.

CHAPTER-15 ONLINE ACCESS SECURED COMMUNICATION

TOPIC-1 Safely Accessing Websites

Revision Notes

- > Data theft is a potential violation of security.
- > Cyber attack is a threat is actually executed
- > People who execute attack are called attackers .
- Malware is an unwanted software that infects our computer and makes it behave in a way that's not acceptable to us.

Common threats to a computer are

- (i) Viruses: (a) Worms (b) Trojans
- (ii) Spyware
- (iii) Adware

- (iv) Spamming
- (v) PC Intrusion : (a) Denial of service (b) Sweeping (c) Password Guessing.
- (vi) Phishing
- (i) VIRUS (Vital Information Rescue Under Siezed)
 - Virus is a malicious program that damages data and files, thereby causing the system to malfunction.
 - A virus can attack any part of the software such as boot block, operating system, files etc.
 - (a) Worms are programs that keep on replicating thereby unnecessarily eating up the disk space.
 - (b) Trojan Horses is a malicious program that is disguised as harmless. It may delete or damage file.

Damage caused by VIRUS

- Viruses damage documents or may even delete specific files. Most of the time a virus is programmed to damage system files.
- Virus tend to slow down the system by executing itself in the background.
- Some viruses attach themselves to the contacts in victims address book and then spread through emails.
- (ii) Spyware is a software that spies on the activities of a computer and reports it to the people who can pay for it. These get installed on a computer without the user's consent by `Piggybacking' a file or a download from internet. These remain active unless someone switches them off or removes them properly

A spyware affects the system in Following ways.

- (a) It monitors information about the owners computing habits, record the keystrokes when the user enters some information and thus lead to identity theft.
- (b) It alters PC settings like the browser home page or appearance of desktop.
- (c) It robs off the system or PC speed or internet access efficiency.
- (iii) ADWARE are the software that deliver unwanted ads to your computer. Though this happens with the user's consent most of the times.
 - An adware just like spyware tracks your computing habits and data to reduce targeted ads that pop-up on your screen.
 - An adware infected PC displays a lot of frequent pop-up ads.
 - As the adware is active in the background and there is a frequent display of ads the speed of system is inhibited.
- (iv) Spamming refers to bulk mails that are sent by an identified or unidentified source.

It is two types

- (a) Malicious In this case the attacker keeps on sending bulk mails until the mail server runs out of space.
- (b) Non malicious In this form bulk mail is sent to many accounts mainly for the purpose of advertisement. Damaging effects of spam
- Billions of spam messages that get circulated across the internet disrupt mail delivery and degrade system performance and overall productivity.
- Deleting spam is time consuming and wastes a lot of valuable time.
- Spam messages may contain fraudulent messages and sometimes act as VIRUS carriers.
- (v) PC intrusion Computers connected to internet are under a constant attack from cyber criminal PC intrusion can occur in following form
 - (a) Sweeper Attack Hackers use a malicious program to delete all the data from the system.
 - (b) **Denial of services –** In this attack all the system resources are used up unnecessarily and the system comes to halt.
 - (c) **Password guessing –** Hackers try to crack password of a system to break in the system and then use the system resources data and information for causing substantial damage.
- (vi) Eavesdropping is the unauthorised monitoring of other people's communications.
 - Eavesdropping can be carried out through any of the communication devices and media such as telephone, emails, Instant messaging, chat rooms, social networking sites, etc.
 - When a message is intercepted in between its routes of transmission and defaced by the attacker, it is called Man-in-the Middle attack.
- (vii) When an imposter tricks a user by sending him authentic looking email there by acquiring sensitive information such as usernames, passwords, credit card information, etc., it is called Phishing:
 - Pharming occurs when a legitimate URL leads to a bogus website by a hacker.

(viii) Cookies are small piece of data sent from a website and stored in a user's web browser. Threats related to cookies are

- (a) Session Data On the sites that you visit regularly your username and password information is pulled from a tracking cookie. Chances are that someone may acquire your cookies and find the encryption key to get your passwords.
- (b) Invasion of Privacy by cookies that track patterns of someone's web activity.
- (c) Cookies of your web activity stored in a public computer pose a larger risk of information being accessed without authorisation.



TOPIC-2

Solutions to Computer Security Threats

Revision Notes

- > Solution to computer security threats can be of two types
 - (a) Active Protection
 - (b) Preventive measures
 - (a) Active Protection involves installing and properly using an antivirus software that includes internet security which includes protection against threats such as viruses, spyware and PC intrusion.
 - (b) Preventive measures include steps to prevent security issues from arising

> Active protection

- Use Anti-Virus and Anti spyware software.
- Download updates regularly
- Run frequent full system scans.
- Use Anti –spam software
- Authorization while logging in
- Authenticate the user
- Use of Firewall
- Keep your computer offline to protect yourself from phishing and pharming
- Contact credit agencies to report any possibilities of Identity theft.

Preventive Measures

- Keep your system up-to-date
- Use caution when downloading files on the internet
- Be careful with email
- Disable cookies
- Keep your email address private
- Use encrypted connection always.
- Install personal firewall.
- Avoid conducting online transactions on public
- Install internet security software
- Use proper file access permissions when sharing files on the internet
- Disconnect from internet when not in use
 - Don't open emails from unknown sources
 - Check the security guideline of websites
 - Instead the of clicking on an embedded link type the general link.
 - Do not click , when in doubt
- An internet firewall is a software that is designed to protect your computer from data and viruses. It can be implemented in two ways
 - (a) Software firewall It is a special type of computer software running on a computer that protects it from PC Intrusion, Trojan or e-mail worms.
 - (b) Hardware firewall is a physical equipment like jammers. It may be another computer also.

CHAPTER-16 TECHNOLOGY AND SOCIETY

TOPIC-1 Intellectual Property Right (IDR)

Revision Notes

- **1. Intellectual property right :** These are the rights given to persons over the creations of their minds. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time.
- 2. Plagiarism : It is the unethical practice of presenting someone else's work or ideas as one's own.
- 3. Digital Rights Management (DRM) : It is a systematic approach to copyright protection for digital media.
 - Its purpose is to prevent unauthorized redistribution of digital media restrict the way consumers can copy content they have purchased.
 - It is implemented by embedding code that prevents copying, specifies a time period in which the content can be accessed or limits the number of devices the media can be installed on.
- 4. Software license
 - It is a document that provides legally binding guidelines for the use and distribution of software.
 - Software licenses typically provide end users with the right to one or more copies of the software without violating copyrights.

Types of software Licenses

- (i) Proprietary License where the copyright stays with the produces and the user is granted the right to use the software.
- (ii) GNU General Public License (GPL), Which are agreements under which "open source" are usually licensed. It allows end users to change the source code too, must also be made available under a GNU GPL license.
- (iii) End User License Agreement (EULA) indicates the terms under which the end user may use the software.
- (iv) Workstation Licenses are Licenses that permit the installation of an application on a single computer. Before installing it on a different machine the software must be removed from the first machine.
- (v) Concurrent use Licenses permits purchase of multiple Licenses of the same software to be installed on multiple machines at the same time.
- (vi) Site Licenses permit the use of software on any number of computer located at a single site.
- (vii) Perpetual Licenses allows the software to be used indefinitely as it come without an expiry date.
- (viii) Non-perpetual License are leases that allow the user to use the software for a specified time limit after which a license fee needs to be paid to be able to use the software.
- (ix) License with Maintenance offers software assurance.
- (x) Creative Commons (CC) license is a public copyright license that enables free distribution of a copyrighted work. By using this license the author allows the users the right to share, use and further build upon a work that he/she has created.

There are several types of creative common licenses that differ by various combinations.

All CC Licenses grant the "baseline rights" such as the non-commercial distribution of the copyrighted work without modification.

Type of license can be determined by selecting a combination out of the following.

- (i) Attribution (By)-It gives the right to copy, distribute, display and perform the work and make derivative works only after giving proper attribution to the original author (Licenser).
- (ii) Share-alike (SA)-The derivative works can be distributed only under a license identical to the original work.
- (iii) (\$) Non-Commercial (NC)-The duplicate work may be distributed, displayed and performed only for non-commercial purposes.

(iv) (iv) (iv) (iv) No Derivative Works (ND)-Only the verbatim copies of the original work may be copied, distributed and displayed. No derivatives or remixes are allowed.

- **5.** Unlike Windows server that requires a commercial license. Apache is the most popular Web server software that enables a computer to host one or more websites, Apache is open source and free to use hence enabling Web hosting companies to offer Web hosting solutions at minimal costs.
 - Platforms supported by Apache-Linux, Windows and Macintosh operating system.
 - Server side scripting Languages- PHP, Python, Perl.
 - Apache Web server software is also known as "Apache HTTP Server"
- 6. Apache software Foundation (ASF) is an American nonprofit corporation founded to support Apache software projects.
 - It is a decentralised open source community.
 - They produce FOSS (Free and Open Source Software) under the terms of the Apache License.
- 7. Open Source means making design of something publicly accessible so that people can modify and share it. Open source Softwares have source code that anyone can modify, develop and distribute.
- 8. **Open Data :** The data that is freely available to everyone to use and republish according to their own requirement, without any restrictions is called open data.
 - Open government data is created by routing government institutions.
 - Open data also includes non-textual material such as maps, genomes, mathematical and scientific formulae, medical data and practice, bioscience and biodiversity.
- **9. Software privacy** : In terms of computer, privacy refers to the information shared with visiting web page, how that information is used, who that information is shared with or if that information is used to track users. Internet Privacy refers to the security level of data published via Internet. It is also known as online privacy. The risks include
 - **Phishing** : Act of stealing secure data including username, password, bank account number, PIN or credit card number.
 - Pharming : Directing a legitimate website visitor to a different IP address.
 - **Spyware** : An offline application that obtains data without a user's consent and then sends it to the spyware source the next time a computers is online.
 - Malware : An application that damages online and offline computers through Trojans, viruses and sypware.
- **10.** Information privacy laws have been formed to prohibit the disclosure or misuse of information about private individuals. Different countries and various laws.
 - The basic principles of data protection as union have adopted
 - The purpose of any data collection should be clearly stated.
 - Records about an individual must be correct and up to date data.
 - The data collected should not be disclosed to other organizations unless specifically authorized and it should be deleted when the purpose of its collection is known.
 - The data should be transmitted to other locations only if their is "equivalent" personal data protection.
 - Sensitive data should be collected only under extreme circumstances.
- **11. e-frauds** : According to oxford dictionary is " Wrongful or criminal deception intended to result in financial or personal gain"
 - Internet frauds/online frauds make use of internet.

Type of Internet frauds

- (i) Internet auction Fraud and non delivery of Merchandise
- (ii) Spam and Identity theft
- (iii) Credit Card Fraud
- (iv) Internet banking fraud.
- 12. Illegal Downloading is obtaining files that you do not have the right to use form the internet.
- **13.** Child Pornography refers to the sexual abuse perpetrated against a child. It can be through any means including print or audio or video that is centred on sex act or the genital organs of children. This also includes computer generated contents.

- **14. Scams** : It is a term used to describe any fraudulent business or scheme that takes money or other goods from an unsuspecting person. After the Internet became widely used, new forms of scams emerged such as scam baiting, email spoofing, phishing or request for helps.
- **15. Computer Forensics** involves using technology to determine and reveal technical criminal evidence. Mostly it involves extraction of stored data for legal purposes.
 - Computer forensics techniques include :
 - (i) Cross driven analysis that correlates data from multiple hard drives.
 - (ii) Live analysis, which obtains data acquisitions before a PC is shut down.
 - (iii) Deleted File recovery.
 - Ethical hacker or white hat hacker is an information security expert who penetrates a network or other computing resource with the permission of its owners to find security vulnerabilities that can be exploited by a malicious hacker.
- 16. Cyber Crimes are the criminally intended activities done in cyberspace.

Various categories of cyber crimes are :

- Cyber crimes against persons.
- Cyber crimes against property.
- Cyber crimes against government.
- Cyber crimes against persons include various crime like transmission of child pornography, harassment (sexual, racial, religious or other) using e-mails and cyber stalking, posting and distributing obscene material.
- Cyber crimes against property refers to all digital properties and unauthorized trespassing through cyberspace.
- Using cyberspace to threaten government and terrorize the citizens of a country generally by hacking a government or military maintenance website is referred to as cyber crime against government.

17. IT ACT 2000 has been enacted by GOI (Government) to facilitate lawful electronic, digital and online transactions

- and mitigate cyber crime.
- Enacted on 9 June 2000
- An amendment to the act was made in 2008 under section 66A to penalize the sending of offensive messages.
- Section 69 was introduced to grant power to authorities to intercept, monitor or decrypt any information through any computers resource.
- It also introduced amendments for child porn, cyber terrorism and voyeurism.



- 1. New Technology improves quality of life for human beings and as a side effect makes it complex and has a negative effects on society and environment.
- 2. Technology is the reflection of people's imagination on solving existing problems.
- 3. Technology such as computers, smartphones, laptop, etc. have made life easier.
- 4. Exchanging information, making faster decisions, interacting socially, entertainment, financial transaction processing, online shopping, managing homes all have become as easy and fast as blink of an eye.
- 5. These technologies though have made life easier but are posing many societal and environmental hazards
- 6. The advancement in technology has made many tasks simple and easy as compared to the conventional ways.
- 7. Sending and receiving messages, documents etc has become a matter of few minutes and is much cheaper.
- 8. No more stepping out early from home to wait for a taxi or public transport for going somewhere.
- 9. Technology itself is not harmful for the society but the way we use it leads to the negative impacts of technology.
- **10.** Negative impacts on society
 - **Resource depletion :** More and more use and fast growing demand of technically advanced gadgets has led to a pressure on mother nature and hence a fast depletion of natural resources.
 - **Increased population :** Technology has helped us live longer by improving health facilities. It has been a negative effect for developing countries.

- **Increased pollution :** Advancement in technology has led to more and more manufacturing units and hence to environmental pollution.
- Lack of social skills : Frequency of interacting personally has been reduced much thus kids and teenagers are deprived of basic social manner.
- **Poor sleep Habits :** Endorsing online activities have affected the sleeping pattern of people.
- Loneliness/Isolation : Engaged in our gadgets we get isolated from the world around us even if we are at a crowded place.
- Addiction : Addiction to technology is no less than the drug addiction.
- **Obesity** : Sitting on social media and dependence on technology for minimal tasks like grocery shopping has led to obesity, Kids don't feel a need to go out and play with friends when they can sit back at home and play online games with their online friends
- **Depression** : Dependance on technology and less interaction with fellow human beings can lead to depression.
- Lack of Privacy : People are opening up their private space by giving their information on other sites thus giving rise to criminal activities.
- Overshare on social media has led to the tendency of crossing social boundaries and cyberstalking has become common.
- Children at much younger age get an exposure to sexual submissions.
- Sexting has become another major problem.
- Lesser attention span : Constant newsfeed, getting hundred of messages in a minute switching application too frequently has led to our mind being programmed for lesser attention span on a particular task. Hence remembering and recalling are becoming tough tasks.
- People are loosing empathies due to lack of knowledge about social ethics and hence social violence is on an increase.
- Using earphones, headphones could cause people to reduce their hearing after sometime.
- **11.** Cultural changes induced by technology
 - Any technological change is the result of the need of a particular culture.
 - The new technology in turn changes the culture and other cultures to which it spreads.
 - Use of online shopping has changed the culture of going out to the market and buying goods.
 - Social media has changed the culture of going to a friends place to have a chitchat.
 - Chat rooms have changed the culture of road side group discussions.
 - Online Home delivery of foods have changed the culture of going out for a dinner or lunch with family and also the culture of home cooked food.
 - Digital Natives is applied to the people born after 1980-1990 the time when social digital technologies came online in west. These people have access to the networked digital technologies.
 - The use of digital technology has changed the way they think or work. Apps has changed a person to a tailor-made self where they are distracted from the inner self.
 - The boundary between private and public spheres has diminished and people show how they appear to live rather than how they really live.
 - Interculturality is another aspect where people are aware of a global outlook of an issue but lack a deeper understanding due to a poor cultural background .
 - Cyberculture is the term coined to mean the set of material and intellectual techniques, practices, attitudes ways of thinking and values that are expressed and developed in cyberspace.



- 1. e-waste is the discarded computers, electrical and electronic gadgets, entertainment device, mobiles, refrigerators etc.
 - e-waste is created when an electronic product is discarded may be for reuse, recycle, resale or salvage, after the end of its usual life.

- e-waste also includes scraps (copper, steel, plastic, etc) and the material which is dumped after reuse or recycling operations.
- It contains toxic pollutants like mercury, lead, cadmium, chromium and plastics.
- These also contain valuable substances like gold, silver and copper.
- Its scientific disposal is therefore very important to protect human and environmental health.
- 2. Recycling of e-waste is an upcoming trend due to secure need to protect environmental and human health.
 - Recycling of e-waste has to be done under a controlled system to prevent pollution and ensure workplace safety and health.
 - Recycling e-waste helps to conserve our earth's precious natural resources.
 - Many materials in **e-waste** can't be tossed in a landfill.
 - WEEE (Waste Electrical and Electronic Equipment) is e-waste or scrap.
 - · Recycling often leads to overseas shipping and dumping of gadgets to third world countries.
 - This leads to health issues in these countries as children there are involved in extraction of precious metals from these e-waste .
 - There is a rise in cybercrimes in these countries as salvaged hard drives can give criminals direct access to some personal data and information.
- 3. Waste Disposal techniques
 - (i) Give your e-waste to a certified Recycler.
 - (ii) Sell off or donate your e-waste.

e-waste management in India.

- Government passed the first law on e-waste management in 2011, based on EPR (Extended Producers Responsibility) which puts the producer responsible for the management for the final stages of the life of its product.
- This law was amended to set collection targets for the producer.
- A new arrangement entitled Producer Responsibility Organization (PRO) has been introduced to be authorized or financed collectively by producers to share the responsibility for collection and channelization of e-waste generated from the end-life of products to ensure environmentally sound management of e-waste.



Revision Notes

1. **Identity Theft :** Stealing or using someone's personal information to gain some financial advantage or other benefits is termed as identity theft.

It is of two types

- (a) True name : In this, the theif uses someone else's personal information to open new accounts (bank, credit card, mobile number etc.)
- (b) Account takeover : It means that the imposter used personal information to gain access to the person's existing accounts.
- 2. **Unique ID** : (Aadhar in India) is a 12 digit randomly assigned number to a person's biometric data a photograph, all 10 fingerprints, iris scans of both eyes as well as to demographic information including name, address, date of birth and gender.
- 3. **Biometrics :** It is a set of human physiological or behavioral characteristics used for identification of a person, these are unique for an individual.
 - Utilizing biometrics for personal authentication is becoming convenient and considerably more accurate than current methods as biometrics link the event to a particular individual.
 - Biometrics basically involves facial recognition, fingerprint, voice recognition, retina scans, palm prints, iris, DNA, keystroke, signature etc.

Type of biometrics :

- (a) **Retina scanner :** It is maximum precise and dependable biometric. Uses unique patterns on someone's retina which remain unchanged throughout the life.
- (b) Iris scanning : Uses digital camera technology with slight infrared illumination to create photographs of the elaborate system of the iris.
- (c) Finger print scanners : scan the graphical glide like ridges on human palms. These are one of the oldest methods of identification.
- (d) Facial biometrics : Every individual has a unique face. Even the identical twins may differ in the placing of their eyebrows, width of eyes, or breath of nose etc. These markers are scanned by biometric scanners to identify an individual.
- (e) Voice recognition uses unique voice pattern of an individual.
- (f) Keystroke : Each person has a unique technique of pressing keys on the basis of which he/she can be identified using a software and a home computer.

TOPIC-5 Gender and disability issues while teaching and using Computers.

Revision Notes

- 1. Gender Inequality
 - In India, cultural values, traditional beliefs, financial dependence on men and restrictions to entering public places are some of the many reasons for gender disparity.
 - Even though genders parity in enrollment is achieved, discrimination towards women still exists as girls are discouraged from choosing subjects at the secondary and tertiary levels which would lead to higher paying career opportunities.
 - The gender disparity that is primarily attributed to complex and deeply embedded cultural values that tend to discourage women's active participation in personal and professional development, is often reinforced in curriculum and textbooks.
 - The lack of participation of women in the use of, and access to ICTs can be attributed to social behavior, culture and religious traditions.
 - Cultural and social attributes are often unfavorable to women's participation in the field of science and technology, which limits their opportunities in the area of ICT.
 - Allocation of resources for education and training often focuses boys and men resulting in lower levels of literacy and education.
- 2. Disability Issues
 - Many students can't participate in regular educational programs because they have a disability.
 - Computer technology offers a broader range of activities for such students.

CHAPTER-17 INTRODUCTION TO PYTHON MODULES

- > The act of partitioning a program into individual components is called 'Modularity'.
- A module is a separately saved unit whose functionality can be reused at will. A Python module has the .py extension
- > A Python module can contain objects like docstrings, variable, constants, classes, objects, statements, functions.
- > The Python modules that come preloaded with Python are called "standard library modules".
- > Python module can be imported in a program using import statement.

- > There are two forms of import statements:
 - (i) import<module name>
 - (ii) from<module> import<object>
- > The math module of Python provides math functionality.
- \triangleright ceil (x) returns the ceiling of x as a float, the smallest integer value greater than or equal to x.
- ▶ floor (x) returns floor of x as a float, the largest integer value less than or equal to x.
- \succ fabs (x) returns the absolute value of x.
- \triangleright pow (x, y) returns x raised to the power y.
- \succ sqrt (x) returns the square root of x.
- \triangleright cos (x) returns the cosine of x radians.
- \blacktriangleright sin (x) returns the sine of x radians.
- \succ tan (x) returns the tangent of x radians.
- > math.pi gives mathematical constant p = 3.141592...
- > math.e gives the mathematical constant e = 2.718281...
- > Random number can be generated using random module
- > Random number generators can be used by including random module using the statement import random.
- random() generates a floating-point number between the range [0.0, 1.0]
- > randint (2a, b) generates a random integer in the range [a, b]. Here the range includes both a & b
- randrange() returns a randomly selected element from the specified range. Syntax:

random.rangrange (start, stop, step)

- > Statistics module provides functions to mathematics statistics of numerical data.
- > It is imported using the statement import statistics.
- > mean() is used to calculate arithmetic mean of the numbers in the list.
- median() is used to return middle value of the numeric data set.
- mode() returns the most common data that occurs in the list.