UNIT -1

INTRODUCTION TO COMPUTER SYSTEM

A computer is an electronic device, under the control of instructions stored in its memory that can accept data (input), process the data according to specified rules(Program) on processor & produces information (output), and store the information for future use.

Data vs Information

Data are raw numbers or other findings which, by themselves, are of limited value.Information is data that has been converted into a meaningfuland useful context.Computers are being used extensively nowadays in
everyday life/every field

In the form of laptop, desktop, smartphone,gadgets etc.

Advantages of computer

- Speed
- Accuracy
- Huge storage
- Versatility
- Tirelessness

Disadvantages of computer

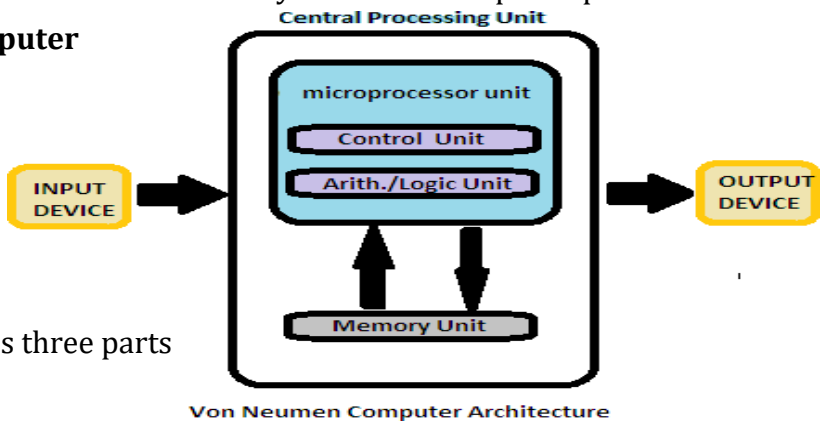
- Data security issue
- Computer crimes
- Health risk
- Bad impact on environment if not properly disposed off

Computer Components Any kind of computers consists of HARDWARE AND SOFTWARE.

Hardware: Computer hardware is the collection of physical elements/parts that constitutes a computer system,such as the monitor, mouse, keyboard, computer data storage, hard drive disk (HDD), system unit (graphic cards, sound cards, memory, motherboard and chips), etc. all of which are physical objects & can be touched.

Software : Software is a generic term for organized collections of computer data and instructions,often broken into two major categories: system software that provides the basic nontask- specific functions of the computer, and application software which is used byusers to accomplish specific tasks.

Functional components of a computer



Von Neumen Computer Architecture

Central processing unit – Comprises three parts

1. Arithmetic/Logic Unit

Performs basic arithmetic operations such as addition and subtraction Performs logical operations such as AND, OR, and NOT. Most modern ALUs have a small amount of special storage units called registers that can be accessed faster than main memory.

2. Control unit

It organizes the computer to work computer as single unit & generates control signals for various devices regarding read/write or execute operation

3. Memory

A collection of cells, each with a u Most computers are byte-addressable

Memory Units – How much memory is required for a file/data/progam etc. is measured by memory units. Following are the memory units.

UNIT	STORAGE
Bit	Binary Digit, Single 1 or 0
Nibble	4 bits
Byte/Octet	8 bits
Kilobyte	1024 bytes
Megabyte	1024 KB
Gigabyte	1024 MB
Terabyte	1024 GB
Petabyte	1024 TB
Exabyte	1024 PB
Zettabyte	1024 EB
Yottabyte	1024 ZB

Memory Types

Primary Memory

Random Access Memory (RAM) - is a type of volatile memory that is stores information on an integrated circuit which hold the data mainly when the program is being executed by the CPU. As it is volatile in nature so it can't store data permanently.

Read Only Memory (ROM) - a non-volatile memory chip in which data are stored permanently, and can not be altered by

Cache Memory - is the volatile computer memory which is very nearest to the CPU,so also called CPU memory, and is between CPU and RAM all the Recent Instructions are Stored into the Cache Memory. It is the fastest memory that provides high-speed data access to a computer microprocessor.

Secondary Storage Devices

A hard disk is a set of stacked disks. Each disk has data recorded electromagnetically in concentric circles, or tracks, on the disk Hard Drive Types

1. Parallel Advanced Technology Attachment (PATA)
2. Serial ATA (SATA)
3. Small Computer System Interface (SCSI)
4. Solid State Drives (SSD)

Upto 12 TB sized HDD is available in the market

Input Devices

Input devices can send data or information to a computer or another device.

Keyboard: It is an input device which sends data in to the computer. The data send depends on the

key pressed by the user.

Mouse: A mouse is a small handheld input device which controls a cursor in a graphical user interface. It can move and select text, files, folders etc. on our computer according to the user input.

Scanner: Scanner optically reads and document, file or image and then changes it into digital signal and sends to the computer.

OMR: optical mark recognition/ reader, is used to read marks on a document and send them tocomputer.

OCR: OCR stands for optical character Recognition, is an input device which reads printed text and sends that to computer.

MICR: Magnetic Ink Character Reader is an input device which generally finds application is banks to process cheques.

Microphone: it receives audio generated by some input source and sends it to a computer. Webcam: it sends the captured images to a computer.

Graphics Tablets: This input device is used to draw using hand.

Trackballs: an upside down mouse ,encased within a socket. Is a cursor control device. Barcode reader: It is used to read the barcode of various items and feed the same to computer. Gamepad: Also known as joy pad is the input controller for video games.

Joystick: these input devices are used to control video games.

Output Devices

A device that can receive data from computer or another device and create output with that data is called output device. Examples of various output devices are as :

Monitor: A monitor is an output device that is responsible for receiving data from a computer and displaying that information as text or images for users to see.

Speakers: Receives sound signal from a computer and then plays that sound signal and thus we hear songs or music or any other audio.

Projector: Gets data from a computer and displays or projects the same information onto a screen or a wall. Projector cannot directly accept data from a user and send that data to another device.

TYPES OF SOFTWARE

Software is an organized instructions/code written by programmers using any of various special computer languages for specific purpose.

Types of software:

(1) System software: controls the basic functions of a computer & hides complexity of computer system from user and application software. E.g. Operating System, Compiler, Interpret etc.

(2) Application software: It handles specialized/ common tasks a user wants to perform, such as banking, hotel management, any data processing, word processing etc.

(3) Utility software: Which helps to manage, maintain and control computer resources. E.g. are antivirus software, backup software

1) **System software**

OPERATING SYSTEM

An Operating System (OS) is a system program that controls and manages the computer resources(resource manager) so that application software can run on it.

Example: Microsoft Windows, Solaris, Linux, MAC OS,Ubuntu, Apple's i-Phone OS etc.

HOW OPERATING SYSTEM WORKS

In any computer or mobile device, the operating system can be termed as the back bone when it comes to software. This is because it has to be there before other programs can be run.It works as a middleman (interface) between machine and user.

At the simplest level, an operating system does two things:

- It manages the hardware resources of the computer system. These resources include such things as the processor, memory, disk space, etc.
- It provides a stable, consistent way for applications to deal with the hardware without having to know all the details of the hardware.

FUNCTIONS OF OPERATING SYSTEM

- Processor management
- Memory management
- Device management
- Storage management
- Application interface
- User interface
- Process management
- Process a program in execution is known as process
- Handling of multiple processes at a time is known as process management.
- Process States

TYPE OF OPERATING SYSTEM

* Single-User, Single Task Operating System:

These operating systems work on single task & single user at a time.E.g. DOS

* Single-User, Multi-Task Operating System:

These operating systems works on more than one task and process them concurrently at a time.E.g. windows 95 or later version of windows

* Multiuser Operating System:

In these OS, multiple users are allowed to access the same data or information at a time via a network. E.g. Unix,Linux,Windows7.

* Multiprocessing Operating System:

Here, a single process runs on two or more processors. All the processing and their management takes place in a parallel way, hence this OS are also called as Parallel Processing. E.g. Linux, UNIX and Windows 7.

* Embedded Operating System:

These are embedded in a device, which is located in ROM.E.g. OS of microwaves,washing machine.

* Distributed Operating System:

In these OS, the computers work in co-operation with each other.

SYSTEM SOFTWARE/PROGRAMMING SOFTWARES

Language processor/Programming tool

As the computer understand machine language(0/1) where as Humans understand High level/Human Lang. Language Processors does the conversion task(high level to machine lang.)

These are of 3 types Language processors

1. Compilers-It convert high-level language code to machine code in one session. It takes time because it have to translate high-level code to lower-level machine language all at once and then save the executable object code to memory.

2. Interpreters-It translates code like a compiler but reads the code and immediately executes that code, and therefore it is faster than a compiler.

3. Assemblers-It translates an assembly language program into machine language. One-pass assemblers go through the source code once. Any symbol used before it is defined will require "errata" at the end of the object telling the linker or the loader to "go back" and overwrite a placeholder which had been left where the as yet undefined symbol was used.

Multi-pass assemblers create a table with all symbols and their values in the first passes, then use the table in later passes to generate code.

(2) Application software

* General Purpose application software

These are ready to use software for daily use purpose

e.g. word processor,spreadsheet,presention,DBMS etc.

* Specific Purpose application software Softwares which are designed for specific task

e.g. Payroll,HotelMgmt,HospitalMgmt,StockMgmt etc.

(3) Utility software/System Utilities

that assist OS in carrying out certain specialized tasks are called utility software.

- Antivirus - An anti-virus scans the system for any virus and if detected, gets rid of it by deleting or isolating it.
- Compression tools - Compression tools are utilities that assist operating systems in shortening files so that they take less space.

(3) Utility software/System Utilities

- Disk Cleanup - Disk cleanup tools assist users in freeing up disk space.
- Disk Defragmenter - Disk defragmenter is a disk management utility that increases file access speeds by rearranging fragmented files on contiguous locations.
- Backup - Backup utility enables backing up of files, folders, databases or complete disks.
- File management tools - Utility software providing regular file management tasks like browse, search, update, preview, etc. are called file management tools.
- Restore – This utility restores the backup earlier taken.
- Device driver or hardware driver is a group of files that enable one or more hardware devices to communicate with the computer's operating system. Without drivers, the computer would not be able to send and receive data correctly to hardware devices, such as a printer

MCQ

1. Smallest measurement unit of computer memory is?
(a) Megabyte
(b) Bit
(c) Byte
(d) Killo Byte

2. How many bytes are in 1 Kilobyte?
(a) 8 Bytes
(b) 128 Bytes
(c) 1024 Bytes
(d) 256 Bytes

3. Read Only Memory (ROM) is a_____memory.
(a) Non Volatile Memory
(b) Volatile Memory
(c) Both (a & b)
(d) None of these

4. Which of the following is designed to control the operations of a computer?
a) Application Software
b) System Software
c) Utility Software
d) User

5. The software designed to perform a specific task:
a) Synchronous Software
b) Package Software
c) Application Software
d) System Software

6. The software substituted for hardware and stored in ROM.
a) Synchronous Software
b) Package Software
c) Firmware
d) Middleware

7. Which of the following is not application software?
a) Windows 7
b) WordPad
c) Photoshop
d) MS-excel

Very Short Answer Questions

1. Namethesoftwarerequiredtomakeacomputerfunctional.Writedownitstwoprimaryservices
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2. What is the need for secondary memory?
3. Draw the block diagram of a computer system. Briefly write about the functionality of each component.

Short Answer Questions

1. State the basic units of Computer along with its sub units and their functions.
2. Differentiate between RAM and ROM.
3. What is the role of CPU in Computer System?

Long Answer Questions

1. Name any four secondary storage media.
2. Define software. Explain with examples- System Software, Utility Software and Application Software.
3. Write short notes on Assembler, Compiler and Interpreter.

Boolean Logic

Boolean Logic

Because of computer understands machine language(0/1) which is binary value so every operation is done with the help of these binary value by the computer.

To understand boolean logic properly we have to understand Boolean logic rule,Truth table and logic gates

Boolean Logic rules

Boolean Algebra is the mathematics we use to analyse digital gates and circuits. We can use these "Laws of Boolean" to both reduce and simplify a complex Boolean expression in an attempt to reduce the number of logic gates required.

A +1=1	Annulment
A +0=A	Identity
A .1=A	Identity
A.0 =0	Annulment
A +A=A	Idempotent
A .A=A	Idempotent
NOTA=A	Double Negation
A +A =1	Complement
A .A =0	Complement
A+B=B+A	Commutative
A.B =B.A	Commutative
A+B =A.B	deMorgan'sTheorem
A.B=A+B	deMorgan'sTheorem

Boolean Expression

A Boolean expression is a logical statement that is either TRUE or FALSE .

A Boolean expression can consist of Boolean data, such as the following:

* BOOLEAN values (YES and NO, and their synonyms, ON and OFF, and TRUE and FALSE)
* BOOLEAN variables or formulas
* Functions that yield BOOLEAN results

De Morgan's Law

The complement of the union of two sets is equal to the intersection of their complements and the complement of the intersection of two sets is equal to the union of their complements. These are called De Morgan's laws.

For any two finite sets A and B

(i) (A+B)'=A'.B'

(ii) (A . B)'=A'+B'

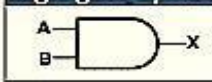
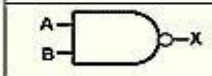
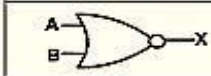
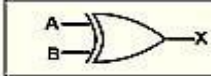
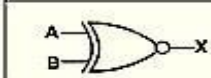
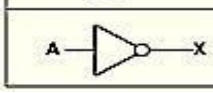
Truth table

A truth table is a mathematical table used in logic. e.g.

A	B	(A and B)	(A or B)	not(A and B)	not(A or B)
True	True	True	True	False	False
True	False	False	True	True	False
False	True	False	True	True	False
False	False	False	False	True	True

Logic Gates

Logic gate is an idealized or physical device implementing a Boolean function. These are used to construct logic circuit.

LOGIC GATES		
Logic gate symbol	Description	Boolean
	The AND gate output is at logic 1 when, and only when all its inputs are at logic 1, otherwise the output is at logic 0.	$X = A \cdot B$
	The OR gate output is at logic 1 when one or more of its inputs are at logic 1. If all the inputs are at logic 0, the output is at logic 0.	$X = A + B$
	The NAND Gate output is at logic 0 when, and only when all its inputs are at logic 1, otherwise the output is at logic 1.	$X = \overline{A \cdot B}$
	The NOR gate output is at logic 0 when one or more of its inputs are at logic 1. If all the inputs are at logic 0, the output is at logic 1.	$X = \overline{A + B}$
	The XOR gate output is at logic 1 when one and ONLY ONE of its inputs is at logic 1. Otherwise the output is logic 0.	$X = A \oplus B$
	The XNOR gate output is at logic 0 when one and ONLY ONE of its inputs is at logic 1. Otherwise the output is logic 1. (It is similar to the XOR gate, but its output is inverted).	$X = \overline{A \oplus B}$
	The NOT gate output is at logic 0 when its only input is at logic 1, and at logic 1 when its only input is at logic 0. For this reason it is often called an INVERTER.	$X = \overline{A}$

Universal gates are the logic gates which are capable of implementing any Boolean function without requiring any other type of gate.

Types of Universal Gates-

In digital electronics, there are only two universal gates which are-

1. NAND Gate
2. NOR Gate

Number System & Encoding Schemes

In general term computer represent information in different types of data forms i.e. number , character ,picture ,audio , video etc.

Computers are made of a series of switches/ gates. Each switch has two states: ON(1) or OFF(0).That's why computer works on the basis of binary number system(0/1).But for different purpose different number systems are used in computer world to represent information. E.g. Octal, Decimal, Hexadecimal.

NUMBER SYSTEM		
SYSTEM	BASE	DIGIT
Binary	2	0 1
Octal	8	0 1 2 3 4 5 6 7
Decimal	10	0 1 2 3 4 5 6 7 8 9
Hexadecimal	16	0 1 2 3 4 5 6 7 8 9 A B C D E F

CONVERSIONS

DECIMAL TO OTHER

1. DECIMAL TO BINARY

Decimal Number System to Other Base

To convert Number system from **Decimal Number System** to **Any Other Base** is quite easy;you have to follow just two steps:

A) Divide the Number(Decimal Number)by the base of target base system(in which you want to convert the number:Binary (2),octal (8)and Hexadecimal(16)).

B) Write the remainder from step1 as a Least Signification Bit(LSB)to Step last as a Most significant Bit(MSB).

Decimal to Binary Conversion	Result
Decimal Number is : **(12345)10** 2 | 12345 | 1 LSB 2 | 6172 | 0 2 | 3086 | 0 2 | 1543 | 1 2 | 771 | 1 2 | 385 | 1 2 | 192 | 0 2 | 96 | 0 2 | 48 | 0 2 | 24 | 0 2 | 12 | 0 2 | 6 | 0 2 | 3 | 1 1 | 1 MSB	BinaryNumberis **(11000000111001)2**

2. DECIMAL TO OCTAL

Decimal to Octal Conversion	Result
Decimal Number is:**(12345)10** 8 | 12345 — 1 LSB 8 | 1543 — 7 8 | 192 — 0 8 | 24 — 0 3 — 3 MSB	Octal Number is **(30071)8**

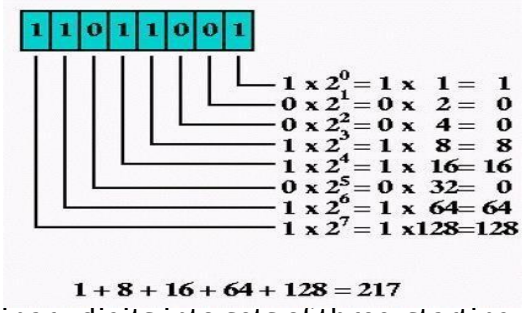
3. DECIMAL TO HEXADECIMAL

Decimal to Hexadecimal Conversion	Result
Example1 Decimal Number is:**(12345)10** 16 | 12345 — 9 LSB 16 | 771 — 3 16 | 48 — 0 8 | 3 — 3 MSB	Hexadecimal Number is**(3039)16**
Example2 Decimal Number is:**(725)10** 16 | 725 — 5 LSB 16 | 45 — 13 (D) 2 — 2 MSB	Hexadecimal Number is **(2D5)16** **Convert** **10,11,12,13,14,15** **To its equivalent…A,B,C,D,E,F**

BINARY TO OTHER

A)Multiply thedigit with 2(with place value exponent).Eventually add all the multiplication becomes the Decimal number.

1. BINARY TODECIMAL



2. BINARY TO OCTAL

An easy way to convert from binary to octal is to group binary digits into sets of three, starting with the least significant (rightmost)digits.

Binary:11100101 =	11 100 101	
	011 100 101	Pad the most significant digits with zeros if necessary to complete a group of three.

Then,lookup each group in a table:

Binary:	000	001	010	011	100	101	110	111

Octal:	0	1	2	3	4	5	6	7

Binary=	011	100	101	
Octal =	3	4	5	= 345oct

3. BINARYTOHEXADECIMAL

An equally easy way to convert from binary to hexadecimal is to group binary digits into sets off our,starting with the least significant (rightmost)digits.

Binary:11100101 =11100101

Then, lookup each group in a table:

Binary:	0000	0001	0010	0011	0100	0101	0110	0111
Hexadecimal:	0	1	2	3	4	5	6	7
Binary:	1000	1001	1010	1011	1100	1101	1110	1111
Hexadecimal:	8	9	A	B	C	D	E	F

Binary=	1110	0101	
Hexadecimal=	E	5	=E5 hex

OCTAL TO OTHER

1. OCTAL TO BINARY

Converting from octal to binary is as easy as converting from binary to octal. Simply lookup each octal digit to obtain the equivalent group of three binary digits.

Octal:	0	1	2	3	4	5	6	7
Binary:	000	001	010	011	100	101	110	111

Octal =	3	4	5	
Binary=	011	100	101	=011100101binary

2. OCTALTOHEXADECIMAL

When converting from octal to hexadecimal, it is often easier to first convert the octal number into binary and then from binary into hexadecimal. For example, to convert 345octal into hex:

(from the previous example)

Octal =	3	4	5	
Binary=	011	100	101	=011100101binary

Drop any leading zeros or pad with leading zeros to get groups of four binary digits (bits):Binary 011100101=11100101

3. OCTALTODECIMAL

The conversion can also be performed in the conventional mathematical way,by showing each digit place as an increasing power of 8.

345 octal=$(3*8^2) +(4*8^1) +(5*8^0) =(3*64) +(4*8) + (5*1)=229$decimal

HEXADECIMAL TO OTHER

1. HEXADECIMALTO BINARY

Converting from hexadecimal to binary is as easy as converting from binary to hexadecimal.Simply lookup each hexadecimal digit to obtain the equivalent group off our binary digits.

Hexadecimal:	0	1	2	3	4	5	6	7
Binary:	0000	0001	0010	0011	0100	0101	0110	0111
Hexadecimal:	8	9	A	B	C	D	E	F
Binary:	1000	1001	1010	1011	1100	1101	1110	1111

Hexadecimal	A	2	D	E	
Binary=	1010	0010	1101	1110	10100010110 binary

2. HEXADECIMAL TO DECIMAL

Convert 42A.1216 into a decimal number. Solution-

The hexadecimal number given is 42 A.12

Positional weights 210-1-2

The positional weights for each of the digits are written in italics below each digit. Hence the decimal equivalent number is given as:

$4\times16^{2}+2\times16^{1}+10\times16^{1}+1\times16^{-1}+1\times16^{-2}$

=1024 +32 +10+0.0625 +0.00390625

$=(1066.06640625)_{10}$

3. HEXADECIMALTOOCTAL

Given hexa decimalnumber is A 72E

Binary equivalent is 1010011100101110=1010011100101110

Forming groups of 3bits from the LSB 001 010011100101 110

Octal equivalent 1 23 45 6

Hence the octal equivalent of $(A72E)_{16}$is $(123456)_{8}$.

ENCODING SCHEMES

American Standard Code for Information Interchange (ASCII)

In the early 1960s, computers had no way of communicating with each other due to different ways of representing keys of the keyboard. Hence, the need for a common standard was realised to overcome this shortcoming. Thus, encoding scheme ASCII was developed for standardising the character representation. ASCII is still the most commonly used coding scheme.

Initially ASCII used7 bit store present characters. Recall that there are only binary digits(0or1).Therefore, total number of different character son the English keyboard that can be encoded by 7-bit ASCII code is 27 = 128. Following Table shows some printable characters for ASCII code. But ASCII is able to encode character set of English language only.

Indian Script Code for Information Interchange(ISCII)

In order to facilitate the use of Indian languages on computers, a common standard for coding Indian scripts called ISCII was developed in India during mid1980s.

It is an 8-bit code representation for Indian languages which means it can represent 28=256characters.It retainsall 128 ASCII codes and uses rest of the codes(128)for additional Indian language character set. Additional codes have been assigned in the upper region (160–255)for the 'aksharas' of the language.

UNICODE

There were many encoding schemes, for character sets of different languages. But they were not able to communicate with each other, as each of them represented characters in their own ways. Therefore, a standard called UNICODE has been developed to incorporate all the characters of every written language of the world. Commonly used UNICODE encodings are UTF-8, UTF-16 and UTF-32.

MCQ

1. When we convert 10011 binary numbers to decimals. Then the solution is :
   a. 20 b.18 c.19 d.16

2. Convert (22) from octal to its corresponding decimal equivalent.
   a. 20 b.18 c.14 d. 81

3. Name the number system which uses alphabets as well as numerical.
   a. Binary number system
   b. octal number system
   c. Decimal number system
   d. Hexadecimal number system

4. The octal equivalent of $(13)_{10}$ is
   a. 18 b. 14 c. 15 d. 16

5. Conversion of hexadecimal number $(69)_{16}$ to octal equivalent will be
   a.451 b. 351 c. 251 d. 151

Very Short Answer Questions

1. Write full form of ASCII and ISCII.
2. What is the base of binary number system?
3. How many digits used by the hexadecimal number system.

Short Answer Questions

1. Expressthefollowingoctalnumbersintotheirequivalentdecimalnumbers.
   (i) 145 (ii) 6760 (iii)455 (iv)10.75
2. Convert the following binary numbers into octal and hexadecimal numbers.

(i)1110001000 (ii)110110101(iii)1010100 (iv)1010.1001