Lecture # 04

Roots Of Computing

Roots Of Computing:

In roots of computing, we see that how we moved a mechanical driven machine to a electronic driven machine. which is a computer.

* **Abacus:**

A mechanical machine from which we perform our calculation is called abacus.
It was one of the oldest computing device.

Structure:

It was a rectangular frame, consisting of beads which attach with a rod. Japani's children perform basic calculation on abacus.

* **Technology Of Gears:**

A few inventors began to experiment with the technology of gear. Blaise Pascal, Gottfried Lebniz and charles Babbage build some machines for their use and these machines were also used in the history of computer.

Gear technology was first introduced by Blaise Pascal They were known as Pascaline

Punch Card:

It was the first technology used in a computer as a input. Herman Hollerith introduce the punch card in 1890. It was used for inputting any information in computers.

Mechanical To Electronic Machine:

The electronic era start from 1900s. Before this only mechanical devices was used. In 1940, George stibitz introduce the first electromechanical machine which is known as Mark I

ENIAC:

The first purely electronic machine or computer in which no mechanical thing is used known as ENIAC. This stand for Electronic Numerical Integrator and calculator.

This machine was build by John and Presper Eckert at the Moree school of Electrical Engineering Uneversity of Pennsylvania.

What is computer science ?

Basically, it is the study of ;
Hardware + Software
Programming
Graphics
Robot
Database
Security etc

Applications OF Computer :

We are living in the computer age of a global - village today. Everything evolves around it whether it is education, medicine, history, sports, research or business. Computer science is just a vast field. Now a days, it has a applications in almost every field of the - real world.
Some of the applications of computer are ;

Information technology
Telecom
Hospitals
Software Development
Service Industry
Pak Army
Freelancing
and many more. even these are uncountable.

The uniqueness of ENIAC is that in the history of computer it was used as a fully electronic machine.

Factsheet Of ENIAC:

Some of the characteristics of ENIAC are;

- The size of ENIAC was 1800 feet.
- 20,000 vacuum tubes are used in ENIAC.
- 1500 relays
- 10,000 capacitors
- 70,000 registers
- It required 200 kilo watt electricity.
- The weight of ENIAC is 30 tons
- The cost of ENIAC is 4,87000 dollars
- PKR = 62.5 million

Rapid Advancement:

- Vacuum tubes change into transistor.
- Transistor change into Integrated circuit.
- Size reduction
- Processing Power doubling in 2 year.
- Steve Jobs and stephen in 1976 was successful to introduce a desktop computer.
- Then IBM Launched PC in 1981 PC means personal Computer. It was the first computer which we can placed on a table and a single person can use this.
- Web
- Smart Phone

Bits :

The smallest storage unit in a computer are called bits. Bits is the basic unit of storage. and all kind of information can be stored in bits.

Bit is the short form of binary digits and One bit can contain only one value 0 or 1.

Every type of data audio, vedio, text, image, number stored in a computer in the form of 0 and 1.

Units	Equivalent
1 Byte	8 bits
1 KB	1024 bytes
1 MB	1024 KB
1 GB	1024 MB
1 TB	1024 GB

Computers always work in the power of 2.

Example

2^1	2^2	2^3
0	00	
1	01	
	10	
	11	

All the characters in a computer are represented by ASCII codes. When we see the ASCII code table. the character A have a code 65. When we convert 65 into binary digits we get,

01000001

We can also convert code into a binary digits with the help of a google

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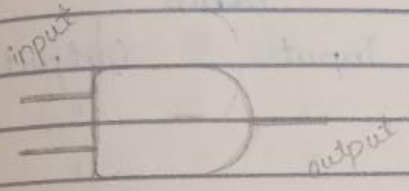
Bolean Operations:

Boolean operation was introduced by George Boolen. Boolean operations are based on binary digit 0 and 1. Bit 0 represent value false and bit 1 represent value true. George Boolen gives us a three basic boolean operations which are AND, OR and XOR. First, we discuss the AND and OR boolean operations.

AND Operation

When both of the inputs are 1 then it produces the output as 1. Otherwise, it gives output as 0.

Symbol



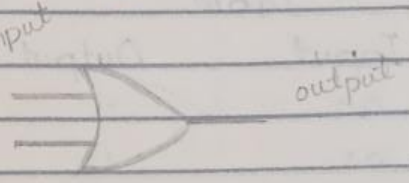
Truth Table

Input	Output
00	0
01	0
10	0
11	1

OR Operation

When any of the input are 1, then it produces the output of 1. Otherwise, it gives output as 0.

Symbols



Truth Table

Input	Output
00	0
01	1
10	1
11	1

XOR Operation

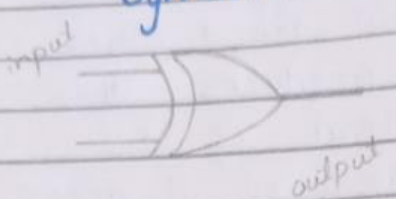
When both inputs are same, then they produce 0 and when both inputs are different, then they

NOT Operation

Not operation pro ces 1 when inpu is 0 and whe the input is 1 then they pro

produce output as a 1.

Symbol

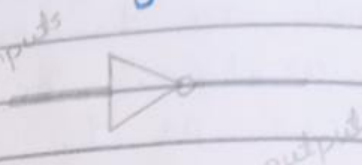


Truth Table

Input	Output
00	0
01	1
10	1
11	0

output as a 0

Symbol



Truth Table

Input	Output
0	1
1	0

HEXADECIMAL NOTATION:

We can convert directly hexadecimal number into a binary digit. Hexadecimal notation use a single symbol to represent a pattern of four bits. We need to remember a table of hexadecimal notation. For this purpose, we use a trick

As we know that hexadecimal notation 5 is equal to 0101 in a bit pattern

Module # 27

Floating Point Notation

* In a floating point notation, when we store integer, the storage of value with fractional part requires not only 0 and 1 binary representation but also the position of a redix point.
* Redix: Number with fractional part have a redix point.
* We can solve redix point with a floating point notation and we can also use 8 bit storage system.
* In a 8 bit storage system, we have a one sign bit, 3 exponent and 4 mantissa.

Example:

* 00111101

0 011 1101

↓ ↓ ↓

Sign bit exponent mantissa

Here, our mantisa is .1101 becoz our exponent 011 is equal to -1.

* Pop In 8 bit system, the top and first left bit is called sign bit

Module # 28

Truncation Error in a Floating Point Notation

- Round-off error is called Truncation error.
- We can reduced the error by using longer mantisa field.

Module # 32

Data Manipulation
CPU Basics

- CPU consist on only three parts
- Arithmetic / logic unit.
  (We can perform some operation from these units e.g addition or subtraction)
- Control Unit
  (We can control the machine activities through the help of control unit)
- Register
  (We can store information and data, some registers store data permanently some are temporary)
- There are two types of register.
  general register unit
  special register unit
-

2	5
2	2 - 1
	1 - 0

Here, our result is

101

But we can also add zero the left side,

0101.

Lecture # 06

Module # 35 and 36

Machine Instruction catagories

- We can catagorized RISC and CISC into three groups
  Data transfer group
  Arithmetic / logic group (Imp)
  Control group
- Data Transfer Group: It move data from one location to another.
- Arithmetic / logic Group: It gives a instruction to control unit that how it can work according to arithmetic and logic unit.
- Control Group: It directly execute the program without doing any manipulation means addition or subtraction.

Program Execution

- In first point, our machine instruction goint from main memory to CPU.
- Each instruction is decode mean it convert into machine language.
- If a instruction is stored in a memory then order exist, otherwise

Module # 34

Data Manipulation
CPU Architecture Philosphies

- CPU designed in such a form that it can recognized instruction encoded as a bit pattern
- Machine language : This collection of instruction along with the encoding system is called machine language.
- RISC stand for reduce instruction set computer.
  It reduce the instruction from the computer.
- CISC : stand for Complex instruction set computer
  All system of incoding and decoding in a complex instruction file work with the help of CISC.

Module # 33

Data Manipulation
Stored Program

- The idea of storing computer program in it's memory is called stored program concept.
- We can store data temporarily in a RAM.

- Early computer not work automatically and modern computer also not flexible. But when we install a software in our computer then it work automatically mean like a human brain.

-

it jumped.

- Special Purpose Register : Those registers which have a special work or task to perform.
- Program Work : It contain the address of those instruction which is executed.

Module # 37
Program Execution Example

- Take an example.
- We have a main memory, we send data from memory to CPU, for doing some work on data.
- In CPU, there are registers, which hold our data to perform work on data.
- In main memory, All the data stored in a cell.

  1 cell = 8 bit

  1 byte.
- Every cell has a unique address
- The conversion of data from a memory to CPU perform with the help of buses.

Module # 31

Data Compression
Compressing Audio and Vedio

* MPEG stand for Motion Picture Export Group.
* The best known system for compressing audio is MP3.
* Temporal Masking:
  It is a software from which we can reduce a loud sound and then after this a human can normly precieve the sound.
* Frequency Masking:
  It is a software, through which we can remove the noise from sound and ~~aa~~ to make it applicable for preciering.
* Kbps — stand for kilo bite per sec.
* Overall, sound record in the form of bit means 0 and 1.
*

Module # 38
Logic Operators

Bitwise Operation : Those operations in which two bits combine to produce a single output by applying the basic operations.

AND OPeration : In this operation, when both bits are one then its gives us one otherwise it is zero.

OR OPeration : In this operation, when both bits are zero then it produce zero otherwise it gives one.

XOR OPeration : In this operation, when both of the bits are same then it produce zero otherwise it gives one.

Masking : The process of AND operation is known as masking.

OPerand means addition.

Module # 39
Rotation And Shift

When we move our screen then it is rotation or shift of the screen.

→

Module # 40

Arithmetic Operations

Example :

2	2
	1-0

2	3
	1-1

3	0011
+ 2	0010
5	0101

2	5
2	2-1
	1-0

Multiplication

8 x 3 = 24

2	8
2	4-0
2	2-0
	1-0

2	24
2	12-0
2	6-0
2	3-0
	1-1

2	3
	1-1

① 0100 → 1000

0100 → 1000 (8 x 3)

0100 → 1000

1100 → 11000 = (24)

Multiplication Rules

0 x 1 = 0

1 x 0 = 0

0 x 0 = 0

1 x 1 = 1

	1000	(8)
x	011	(3)
	1000	
	1000x	
	0000xx	
	011000	(24)

Division :

In a devision, we can subtract two values and get our result.

Module # 41
Role Of Controller

Controller:

Those devices which control overall the computer is known as controller.

e.g CPU

Port:

The place at the back of computer where we can attached our cable to a computer is called port.

USB:

It stand for universal seriel bus. We can store our personal data in USB.

Bus:

Those wires which connect the CPU and main known bus in the language of computer.

Store And Load:

When one file load from one place to another then it is called loading.

DSL means
Digital Subcriber line

Cable Modems:
It is very important in computer language.
Kbps (Killo bits per second)
Mbps (Million / Mega)
Gbps (Billion / Gega)
8 Kbps = 1 KBps

Module # 44
Pipelining

Pipelining:
Electric pulses travel through a wire but no faster than the speed of light. Light travel 1 foot in a nanoseconds means (one billionth of a second)
On the otherhand, compute require 2 nanoseconds.

Module # 42 and 43
Direct Memory Access And Handshaking

DMA :

It stand for Direct memory access The ability of a controller to access a main memeory is called DMA. Main memory means RAM.

Communication Media And Communication rates

There are two types of communication in a compuler.
Parrallel communication
Seriel communication

Parallel :

In a parallel communication, our data flow and run in a good manners Data files not mixed with each other.

Seriel :

In a seriel communication, one file transfer after the other. Data move slowly It move in a singal Path and take a more time.

Module # 45
Operating System History

Windows are called operating system.

FIFO (first in first out)

Queue:

Queue means line. Computer excute the data in the form of Queue.

A queue is a storage organization in which objects are ordered in FIFO fashion.

Interactive Processing:

Those processing in which we process our data and after process it gives us some result, this is called interactive processing

e.g.

2 + 2

4

This is an example of interactive processing.

Module # 46
Operating System
Basic Concept 1

Time Sharing :

If a one system use at a same time by 6 users, then chance of slow - networking is possible, To solve such a problem, An OS were designed to service multiple users at the same time called sharing of time or time sharing.

Lecture # 51
Operating System
Process of Booting

Booting :

In a simple words, the process of starting operating system is called booting.

ROM :

Read Only Memory

It present under the CPU. The data which we stored is stored in the RAM.

Boot Loader :

This is an permenantly stored program which present under the ROM.

When we turned on the machine it is initially execuled

Fireware Update :

To update the operating system, boot loaders (which stored in ROM) we use a fireware update.

Module # 52 & 53
Process And It's Administration.

OS means operating system.

Program:
Operating system is the distinction between a program and the activity of executing program

Process:
The activity of executing program under the control of a operating system known as a process.

For
Our processes, schedular maintain the blog of information in a main memory called a process table. ↓(RAM)

When we perform many of the taskes at a same time known as multi-program.

Process Switch:
Also know as context switch. The Process of changing the process is called process switch.

Time Slice:

Deviding the time into short segments, each one is called a time slice.

Interrupt:

It initialized the time circuit that will indicate the by the end of the slice by gathering a signal.

Whatever we send data from one place to another, then it handles by a interrupt handling

Module # 54.

Handling Competition b/w Princess

Those devices which work together are called perepheri cal

process then it is called forking.

Spooling :

The technique of sharing a one printer with many computers are called spooling.

Module # 57
Security Attacks From Outside.

① First of all, we need to secure our computer.

② Accounts are established by a person known as super user or the administration.

③ Auditing Software :

These software have been developed to record and analyze the activities taking place within the computer system. These are important for software

④ Sniffing Software :

If the data or record of the computer has been deleted from us, then this software help us to report the older software.

Module # 58
Security Attacks From Inside

The security attacks from inside occurs when our computer face a virus issue.
Virus can come in CPU, RAM, Hard disk etc.

Privilleged Instruction:
Such a virus or instruction which we give to our CPU computer And then it change it's register or memory location. It can also destroy our computer.

Module # 59
Networking And Internet
Network Classification

Basically, we are familiar with a three types of:

LAN (Local area Network)
WAN (Wide Area Network)
MAN (Metropolitan Network)

Module # 55
Operating System
Samaphores

Our disk has been divided into a sections or tracks. So semaphores a control all these things and get excess / access.

Critical Region:
A sequence of execution of instruction is called critical region

Mutual Exclusion:
If we can execute a single critical region at a time is called mutual exclusion.

Module # 56
Deadlock

When a two programs comes for execution at a same time Here our program will be destroyed and a situation is known as deadlock.

Forking:
If we want to create any new