27/05/2025 - OOP

Procedurue Oriented Programming ⇒ Modular Programming

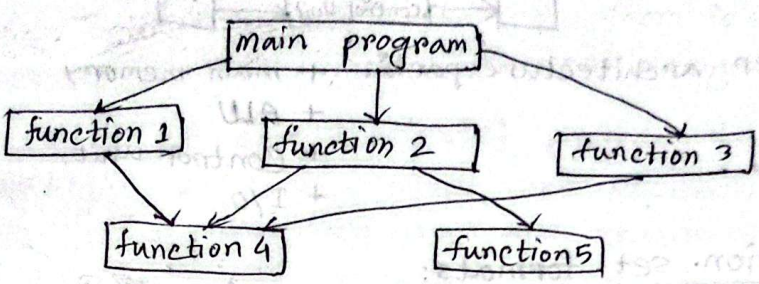
Function oriented Programming (কাজ উপর নির্ভর করে)

বড় প্রোগ্রামকে ছোট ছোট ভাগে ভাগ করে লেখা → function/module

" function এর উপর নির্ভর করে যে language তাকে procedure oriented programming language বলে

Object oriented Programming

* এটা কোনো নির্দিষ্ট programming language না। এটা programming language এর বিশেষ বৈশিষ্ট্য/features.



Procedure oriented

After OOP
- UML - unified modeling language
- Design pattern

27/05/2025 - DS

ছড়িয়ে ছিটিয়ে থাকা data সমূহকে logical way তে সাজানোকেই Data stucture বলে।

data structure operations :

- traverse
- search
- insert
- delete

} basic operations

data type: (i) Primitive → (int, float, double, char, bool)

(ii) Non-premitive → custom made → (string, array)

- Linear : stores data sequentially (array, linked list, stack, queue)
- Non-linear : stores data non sequentially (tree, graph)

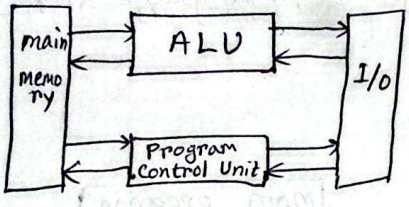
```
a = a + b;
b = a - b;
a = a - b;
```

```
<a href="mailto:-">
```

28/05/25 - CA - Organization & Architecture

Computer Architecture: It refers to "those attributes of system visible to a programmer" or put another way "those attributes that have direct impact on the logical execution of a program."

Computer organization: It refers to the operational units and their interconnections that realize the architectural specifications.



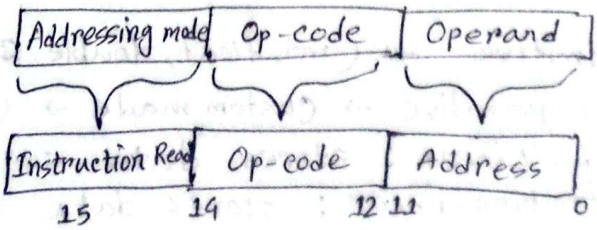
Computer architecture parts: + main memory
+ ALU
+ Control unit
+ I/O

Instruction set formats:

An instruction set format is used to design the layout of the bits allocated those elements of instruction or the instruction format explicitly or implicitly indicates the addressing modes used for each operand in that instruction.

There are three types of instruction set format:
→ fixed length / single bit instruction
→ variable / two bit "
→ Hybrid / three bit "

16 bit instruction



bit: 15 if ⇒ 0 → direct
bit: 15 if ⇒ 1 → indirect

28/05/25 - DS

Data = values/set of values
Data item = single unit of values.
- group item (can be divided into subparts)
- elementary item/simple/atomic data item (cannot be divided")

Entity = something that has attributes/properties which maybe assigned values
Entity set = entities with similar attributes

29/05/25 - OOP

Characteristics of procedure-oriented programming:
- Emphasis is on doing things (algorithm).
- Large programs are divided into smaller programs known as functions.
- Most of the functions share global data.
- Data move openly around the system from function to function.
- functions transform data from one form to another.
- Employs top-down approach in program design.

characteristics of object oriented programming:
- Emphasis is on data rather than procedure (function).
- Programs are divided into what are known as objects.
- Data structures are designed such that they characterize the objects.
- Functions that operate on the data of an object are tied together in the data structure.
- Data is hidden and cannot be accessed by external functions.
- Objects may communicate with each other through functions.
- New data and functions can be easily added whenever necessary.
- Follows bottom-up approach in program design.

29/05/25 - ODE

Differential equation syllabus

1st order
(i) General solution
(ii) Separable equation
(iii) Homogeneous equation
(iv) Non-Homogeneous linear equation
(v) Exact differential equation
(vi) Integrating factor
(vii) Linear differential equation
(viii) Bernouli differential equation

Higher order
(i) Higher order D.E.
(ii) Operator method
(iii) Operator method with initial value problem.
(iv) Undermine coefficient method
(v) Variation of parameter
(vi) Singular solution

Differential equation: Differential equation is an equation which contain the derivatives.

Ex: $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 3y = 0$

Ordinary Differential equation: The differential equation ~~is an equation~~ which have only one independent variable is called ordinary differential equation.

Ex: $\frac{d^2y}{dx^2} + y = 0$

Partial Differential equation: The differential equation which have more than one independent variable is called partial differential equation.

Ex: $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$

[u = dependent
x, y, z = independent

Order of a differential equation: The highest derivative of a differential equation denotes the order of that diff. equation.

Ex: $\frac{d^3y}{dx^3} + \left(\frac{d^2y}{dx^2}\right)^2 + y = 0$

This is a third order ordinary diff. eq.

Degree of a differential equation: The power of highest derivative denotes the degree of a differential equation.

Ex: $\left(\frac{d^4y}{dx^4}\right)^3 + \left(\frac{d^3y}{dx^3}\right)^7 + y = 0$

This is a third degree fourth order ordinary differential eq.

Q: Find degree and order of D.E: $\sqrt[3]{\frac{d^3y}{dx^3}} = \frac{d^2y}{dx^2} + y$

$\Rightarrow \frac{d^3y}{dx^3} = \left(\frac{d^2y}{dx^2} + y\right)^3$

$\therefore$ order: 3
$\therefore$ degree: 1

1/6/25 - ODE Find order and degree

③ $\frac{d^2y}{dx^2} = k\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{5/2}$

squaring both sides

$\left(\frac{d^2y}{dx^2}\right)^2 = k^2\left[1 + \left(\frac{dy}{dx}\right)^2\right]^5$

∴ This is a 2nd order and 2nd degree ordinary diff. equation.

④ $\frac{d^3y}{dx^3} + 3\left(\frac{dy}{dx}\right)^4 + y = 0$

∴ This is a 3rd order 1st degree ordinary diff. equation

⑤ $\sqrt[3]{\left(\frac{d^3y}{dx^3}\right)^4 - 5x\frac{d^2y}{dx^2} + y} = \sqrt[5]{\frac{dy}{dx} + y^2 - x}$

$\Rightarrow \left\{\left(\frac{d^3y}{dx^3}\right)^4 - 5x\frac{d^2y}{dx^2} + y\right\}^5 = \left(\frac{dy}{dx} + y^2 - x\right)^3$

This is a 3rd order 20 degree ordinary diff. equation.

উপাদকের 20 পাওয়ার দিয়ে

General solution

⑧ $y = A\cos x + B\sin x$

$\frac{dy}{dx} = -A\sin x + B\cos x$

$\frac{d^2y}{dx^2} = -A\cos x - B\sin x$

$= -(A\cos x + B\sin x)$

$\Rightarrow \frac{d^2y}{dx^2} = -y$

$\therefore \frac{d^2y}{dx^2} + y = 0$ (Ans)

A, B = arbitary constant

x = independent variable

y = dependent variable

⑩ $y = Ae^x + Be^{-x}$

$\rightarrow \frac{dy}{dx} = Ae^x - Be^{-x}$

$\Rightarrow \frac{d^2y}{dx^2} = Ae^x + Be^{-x}$

$\Rightarrow \frac{d^2y}{dx^2} = y$

$\therefore \frac{d^2y}{dx^2} - y = 0$ (Ans

⑨ $x^2 + y^2 = a^2$

$\Rightarrow \frac{dy}{dx} = 2x + 2y\frac{dy}{dx} = 0$

$\Rightarrow$ [illegible]

$\Rightarrow = y\frac{dy}{dx} + x = 0$

16/06/25- OOP

Basic concepts of OOP

Objects: Basic runtime entities in an object-oriented system.
Can represent a person, a place, a table of data, or any item.
"objects can interact with each other @ runtime"
"an object is a collection of data + codes to manipulate that data."

Classes: • collection of objects of similar type.

Encapsulation: wrapping up of data & functions into a single unit.
আবদ্ধ করে রাখা (ডেটা সিকিউরিটির জন্য)
Only functions which are wrapped in the class can access the data. Others can't access it. This insulation of data from direct access is called data/information hiding."

Abstraction: Act of representing essential features without including details.
ex: class
Abstraction = list of abstract attributes + functions to operate on these
(data members) (methods) (member functions)

Inheritance: The process by which objects of one class inherit the properties of objects of another class.
উত্তরাধিকার বা অন্য class এর বৈশিষ্ট্য নিজের class এ নেয়া

Polymorphism: An operation may exhibit different behaviours in different instances.
বহুরূপীতা
ex: operator overloading (int + int = addition ; string + string = concatenation)
function overloading (int function(int) ; double function(double))

Dynamic Binding: (late binding) : The code associated with a given procedure call is not known untill the time of the call at runtime. Dynamic Binding is associated with polymorphism & inheritance.

Three main pillars of OOP

```
#include <iostream>
using namespace std;
class person {
    class declaration
};
void person::
    getData(){
    method declaration
}
int main(){
    class person p;  obj
    p.getData();
    method
}
```

17/06/25 - OOP

- OOP languages are divided into two categories:
  1. object-based programming language
  2. Object-oriented "
- features required for object based language:
  * Data encapsulation
  * Data hiding and access mechanisms
  * Automatic initialization and clear-up of objects
  * Operator overloading
- features required for object oriented language
  * object-based features + inheritance + dynamic binding (late binding)

Ch. 2: 2.2 (H.W.)
2.3

2 Beginning with C++

Basic c++ program

```
#include <iostream>          // হেডার ক্লাস (.h থাকলে হেডার ফাইল)
using namespace std;
int main(){
    cout << "Hello world";   // C তে ছিল left shift operator, C++ এ insertion/put-to operator (left-shift এর পাশাপাশি)
    return 0;
}
```

```
#include <iostream>
using namespace std;
int main(){
    float n1, n2, sum, avg;
    cout << "Enter two numbers: ";
    cin >> n1;               // C তে ছিল right shift operator, C++ এ (right shift এর পাশাপাশি) extraction/get-from operator
    cin >> n2;
    sum = n1 + n2;
    avg = sum / 2;
    cout << "Sum = " << sum << "\n";
    cout << "Average = " << avg << "\n";
    return 0;
}
```

একই স্টেটমেন্টে একাধিক I/O operator ব্যবহার করলে তাকে cascading of I/O operator বলে।

17/06/25 - ODE

⑥ $y = e^x (A\cos x + B\sin x)$

$$\frac{dy}{dx} = e^x (A\cos x + B\sin x) + e^x (-A\sin x + B\cos x)$$

$$\Rightarrow \frac{dy}{dx} = y + e^x (-A\sin x + B\cos x)$$

$$\Rightarrow \frac{dy}{dx} - y = e^x (-A\sin x + B\cos x)$$

$$\Rightarrow \frac{d^2y}{dx^2} - \frac{dy}{dx} = e^x (-A\sin x + B\cos x) + e^x (-A\cos x - B\sin x)$$

$$\Rightarrow \frac{d^2y}{dx^2} - \frac{dy}{dx} = \frac{dy}{dx} - y - e^x (A\cos x + B\sin x)$$

$$\Rightarrow \frac{d^2y}{dx^2} - \frac{dy}{dx} = \frac{dy}{dx} - y - y$$

$$\Rightarrow \frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0 \quad \text{(Ans)}$$

⑦ $y = e^x (A\cos 2x + B\sin 2x)$

$$\frac{dy}{dx} = e^x (A\cos 2x + B\cos 2x) + e^x (-2A\sin 2x + 2B\cos 2x)$$

$$\frac{dy}{dx} = y + e^x (-2A\sin 2x + 2B\cos 2x)$$

$$\frac{dy}{dx} - y = e^x (-2A\sin 2x + 2B\cos 2x)$$

$$\frac{d^2y}{dx^2} - \frac{dy}{dx} = e^x (-2A\sin 2x + 2B\cos 2x) + e^x (-4A\cos 2x - 4B\sin 2x)$$

$$\frac{d^2y}{dx^2} - \frac{dy}{dx} = \frac{dy}{dx} - y - 4e^x (A\cos 2x + B\sin 2x)$$

$$\frac{d^2y}{dx^2} - \frac{dy}{dx} = \frac{dy}{dx} - y - 4y$$

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = 0 \quad \text{(Ans)}$$

(11) $y = Ae^{2x} + Be^{-2x}$

$\Rightarrow \frac{dy}{dx} = 2Ae^{2x} - 2Be^{-2x}$

$\Rightarrow \frac{d^2y}{dx^2} = 4Ae^{2x} + 4Be^{-2x}$

$\Rightarrow \frac{d^2y}{dx^2} = 4(Ae^{2x} + Be^{-2x})$

$\Rightarrow \frac{d^2y}{dx^2} = 4y$

$\Rightarrow \frac{d^2y}{dx^2} - 4y = 0$ (Ans)

(12) $y = Ae^{x} + Be^{2x} + Ce^{3x}$

$\frac{dy}{dx} = Ae^{x} + 2Be^{2x} + 3Ce^{3x}$

$\frac{dy}{dx} = (Ae^{x} + Be^{2x} + Ce^{3x}) + Be^{2x} + 2Ce^{3x}$

$\frac{dy}{dx} = y + Be^{2x} + 2Ce^{3x}$

$\frac{dy}{dx} - y = Be^{2x} + 2Ce^{3x}$

$\frac{d^2y}{dx^2} - \frac{dy}{dx} = 2Be^{2x} + 6Ce^{3x}$

$\frac{d^2y}{dx^2} - \frac{dy}{dx} = 2(Be^{2x} + 2Ce^{3x}) + 2Ce^{3x}$

$\frac{d^2y}{dx^2} - \frac{dy}{dx} = 2(\frac{dy}{dx} - y) + 2Ce^{3x}$

$\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2(\frac{dy}{dx} - y) = 2Ce^{3x}$

$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 2Ce^{3x}$

$\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 6Ce^{3x}$

$\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 3(2Ce^{3x})$

$= 3(\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y)$

$= 3\frac{d^2y}{dx^2} - 9\frac{dy}{dx} + 6y$

$\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$

(13) $xy = ae^{x} + be^{-x} + x^2$

$\Rightarrow xy - x^2 = ae^{x} + be^{-x}$

$\Rightarrow 1 \cdot y + x\frac{dy}{dx} - 2x = ae^{x} - be^{-x}$

$\Rightarrow \frac{dy}{dx} + 1 \cdot \frac{dy}{dx} + x \cdot \frac{d^2y}{dx^2} - 2 \cdot 1 = ae^{x} + be^{-x}$

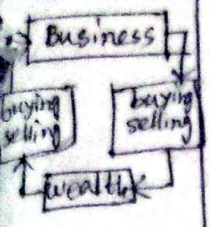
$\Rightarrow x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 2 = xy - x^2$

$\Rightarrow x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 2 - xy + x^2 = 0$ (Ans)

```
int LA[upper_bound];
int K = lower_bound;
while (K < upper_bound){
        printf("%d", LA[K]);
        K = K+1;
}
```

Md Rakibul Islam (DU)

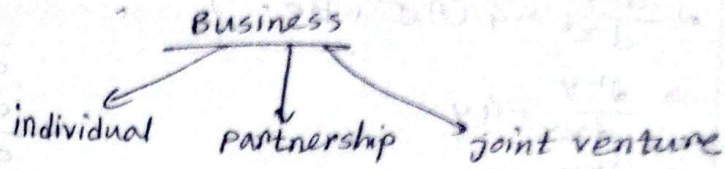
19/06/25 - Fundamentals of Business Studies



Business: Production of goods and services for earning profit.
+ sales at market (group of potential customer of goods or services)
↓
marketing

করতে যা লাগবে

(i) Raw materials
(ii) Land
(iii) Labour
(iv) Capital

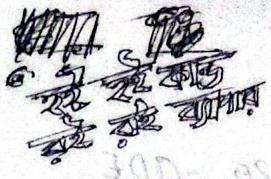


Entrepreneurship: নিজের কর্মসংস্থান নিজে করা

23/06 → Features/characteristics:
(i) Profit → life blood of business
(ii) Capital
(iii) Dealing in goods and services
(iv) Motive
(v) Organization
(vi) Production of goods.
(vii) Risk → ঝুঁকিপূর্ণ প্রশাসকেন্দ্র
(viii) Employment
(ix) Social welfare
(x) Regular transaction

Basic elements/components of business:
(i) Organizational structure
(ii) Land
(iii) Capital
(iv) Legality
(v) Employee
(vi) Production
(vii) Distribution
(viii) Profit
(ix) Risk
(x) Financing

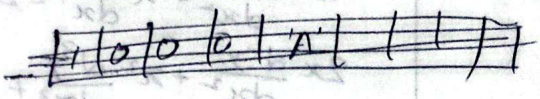
```
int hour = min / 60;
int min = min % 60;
```



int arr[][]

```
#include <iostream>
using namespace std;
int main() {
    double min, hour;
    cout << "Enter the time in minutes: ";
    cin >> min;
    hour = min / 60;
    cout << min << " minutes is " << hour << " hours" << endl;
    return 0;
}
```

```
#include <string.h>
#include <stdio.h>
using namespace std;
int main(){
struct student {
    int roll;
    char name[20];
};
int main(){
    struct student s1;
    s1.roll = 123;
    s2.name = "Rupa"; ✗ error
    strcpy(s1.name, "Rupa");
    printf("%d\n", s1.roll);
    printf("%s\n", s1.name);
    return 0;
}
```



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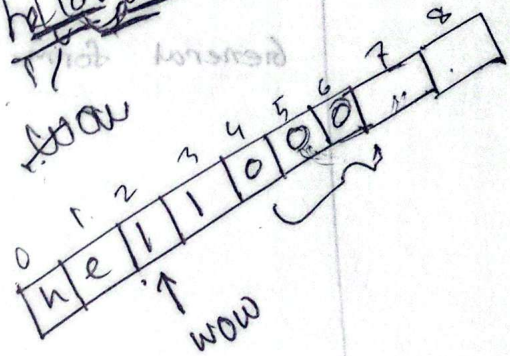
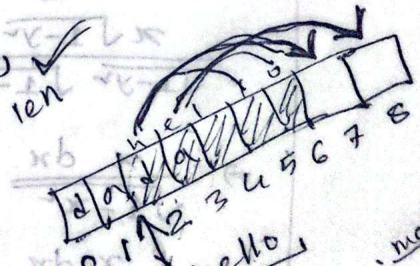


String operations

substring (string, initial, length) ✓
index (text, pattern) ✗
concatenation (str1, str2)
length (str) ✓
insert (text, position, string)
delete (text, position, length)
replace (text, pattern1, pattern2)



19/06/25 -ODE

(16) $y = a + b\ln x + c(\ln x)^2 + 3x^2$

$\frac{dy}{dx} = 0 + b\frac{1}{x} + 2c\ln x \frac{1}{x} + 6x$

$\frac{dy}{dx} = \frac{b + 2c\ln x + 6x^2}{x}$

$x\frac{dy}{dx} = b + 2c\ln x + 6x^2$

$1\frac{dy}{dx} + x\frac{d^2y}{dx^2} = 0 + 2c\frac{1}{x} + 12x$

$x\frac{d^2y}{dx^2} + \frac{dy}{dx} = \frac{2c + 12x^2}{x}$

$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 2c + 12x^2$

$2x\frac{d^2y}{dx^2} + x^2\frac{d^3y}{dx^3} + 1\frac{dy}{dx} + x\frac{d^2y}{dx^2} = 0 + 24x$

$x^2\frac{d^3y}{dx^3} + 3x\frac{d^2y}{dx^2} + \frac{dy}{dx} - 24x = 0$

(15) $xy = c^2$

$\Rightarrow x\frac{dy}{dx} + y = 0$

$\Rightarrow x\,dy + y\,dx = 0$

Separable equation

General form of separable equation: $M(x)N(y)dx + P(x)Q(y)dy = 0$

$\Rightarrow \frac{M(x)N(y)\,dx}{P(x)N(y)} + \frac{P(x)Q(y)\,dy}{P(x)N(y)} = 0$

$\Rightarrow \frac{M(x)}{P(x)}dx + \frac{Q(y)}{N(y)}dy = 0$

$\Rightarrow \int\frac{M(x)}{P(x)}dx + \int\frac{Q(y)}{N(y)}dy = c$

(1) $x\sqrt{1-y^2}\,dx + y\sqrt{1-x^2}\,dy = 0$

This is a variable separable equation;

∴ dividing both sides by $\sqrt{1-y^2}\sqrt{1-x^2}$

$\frac{x\sqrt{1-y^2}}{\sqrt{1-y^2}\sqrt{1-x^2}}dx + \frac{y\sqrt{1-x^2}}{\sqrt{1-y^2}\sqrt{1-x^2}}dy = 0$

$\Rightarrow \frac{x\,dx}{\sqrt{1-x^2}} + \frac{y\,dy}{\sqrt{1-y^2}} = 0$

$\Rightarrow \int\frac{x\,dx}{\sqrt{1-x^2}} + \int\frac{y\,dy}{\sqrt{1-y^2}} = c$

$\Rightarrow \int\frac{-2x\,dx}{\sqrt{1-x^2}} + \int\frac{-2y\,dy}{\sqrt{1-y^2}} = -2c$

$\Rightarrow 2\sqrt{1-x^2} + 2\sqrt{1-y^2} = -2c$

$\Rightarrow \sqrt{1-x^2} + \sqrt{1-y^2} = -c$ (Ans)

(2) $y\sqrt{x^2-1}\,dx + x\sqrt{y^2-1}\,dy = 0$

This is a variable separable equation

∴ dividing both sides by: xy

$$\frac{y\sqrt{x^2-1}\,dx}{xy} + \frac{x\sqrt{y^2-1}\,dy}{xy} = 0$$

$$\Rightarrow \frac{\sqrt{x^2-1}}{x}\,dx + \frac{\sqrt{y^2-1}}{y}\,dy = 0$$

$$\Rightarrow \int \frac{\sqrt{x^2-1}}{x}\,dx + \int \frac{\sqrt{y^2-1}}{y}\,dy = 0 \quad \text{---(i)}$$

Let, $I_1 = \int \frac{\sqrt{x^2-1}}{x}\,dx$ and $I_2 = \int \frac{\sqrt{x^2-1}}{y}\,dy$

$$\therefore I_1 = \int \frac{\sqrt{x^2-1}}{x}\,dx$$

putting $x = \sec\theta$, $dx = \sec\theta\tan\theta\,d\theta$

$$= \int \frac{\sqrt{\sec^2\theta - 1}}{\sec\theta}\,\sec\theta\tan\theta\,d\theta$$

$$= \int \sqrt{\tan^2\theta}\,\tan\theta\,d\theta$$

$$= \int \tan\theta\,\tan\theta\,d\theta$$

$$= \int \tan^2\theta\,d\theta$$

$$= \int (\sec^2\theta - 1)\,d\theta$$

$$= \int \sec^2\theta\,d\theta - \int d\theta$$

$$= \tan\theta - \theta + c_1$$

$$= \sqrt{x^2-1} - \sec^{-1}x + c_1$$

Similarly, $I_2 = \int \frac{\sqrt{y^2-1}}{y}\,dy$

$$= \sqrt{y^2-1} - \sec^{-1}y + c_2$$

From (i) we get,

$$\sqrt{x^2-1} - \sec^{-1}x + c_1 + \sqrt{y^2-1} - \sec^{-1}y + c_2 = c$$

$$\Rightarrow \sqrt{x^2-1} - \sec^{-1}x + \sqrt{y^2-1} - \sec^{-1}y = k$$ (Ans)

③ $\frac{dy}{dx} = y\tan x + y^3 \tan x$

$\Rightarrow \frac{dy}{dx} = (y + y^3)\tan x$

$\Rightarrow dy = (y + y^3)\tan x\, dx$

$\Rightarrow \frac{dy}{y + y^3} = \tan x\, dx$

$\Rightarrow \int \frac{dy}{y + y^3} = \int \tan x\, dx$

$\Rightarrow \int \frac{dy}{y(1+y^2)} = \ln \sec x$ ——— (A)

let, $I = \int \frac{dy}{y(1+y^2)}$

Now, $\frac{1}{y(1+y^2)} \equiv \frac{A}{y} + \frac{By + C}{1+y^2}$ ——— (i)

$\Rightarrow 1 \equiv A(1-y^2) + (By + C)y$

Putting $y = 0$ then,

$1 = A(1+0) + 0$

$A = 1$

Equating the coefficient of y^2 and y on both sides

$0 = A + B$ | $0 = C$

$B = -A = -1$ | $C = 0$

$\therefore B = -1$

from (i) we get,

$$\frac{1}{y(1+y^2)} = \frac{1}{y} + \frac{-y + 0}{1 + y^2}$$

$$\int \frac{dy}{y(1+y^2)} = \int \frac{1}{y}\, dy - \int \frac{y\, dy}{1+y^2}$$

$$= \ln y - \frac{1}{2}\int \frac{2y\, dy}{1+y^2}$$

$$= \ln y - \frac{1}{2}\ln(1+y^2) + c_2$$

from (A) we get,

$\Rightarrow \ln y - \frac{1}{2}\ln(1+y^2) + c_2 = \ln \sec x + c_1$

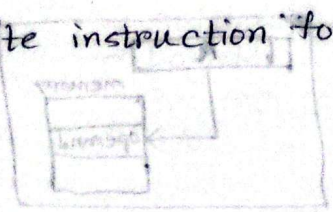
$\Rightarrow \ln y - \frac{1}{2}\ln(1+y^2) = \ln \sec x + c$

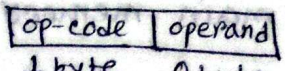
(Ans)

16/06/25 - C.A. Instruction Set Format

Instruction word size: Word length will be that how much data bit it can handled at a time word depend on the type of microprocessor.

simple byte instruction format:

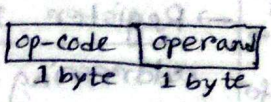




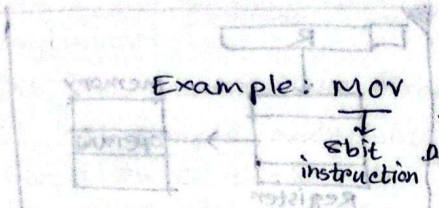
→ Ex: MOV AB

operand — Register / Register Pair / No operand

* two byte instruction set format: Instruction →

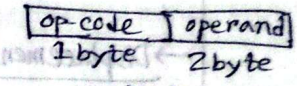


operand — 8bit data / 8bit address } 2 byte.



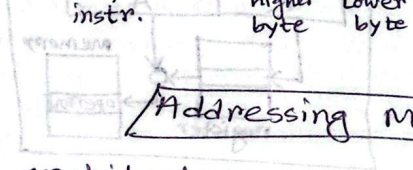
Example: MOV A, 34H
- MOV: 8bit instruction
- A: Destination
- 34H: source

* three byte instruction set format: Instruction →



operand — 16bit data / 16 bit address

Example: LXI B, 3050H
- LXI: 1 byte instr.
- B: 8bit
- 30: higher byte
- 50H: 8bit, lower byte



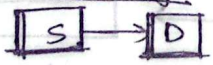
18/06/25 - C.A.

Addressing Modes

In the computer architecture, the source and destination register actually act as operands. There are ~~three~~ different types of instruction format for identifying all those operands. All these formats are called addressing modes.

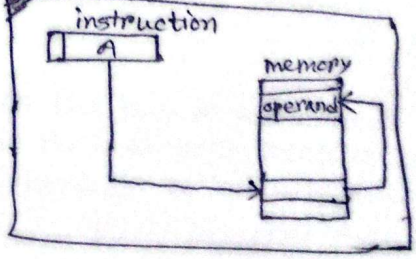
The most common addressing techniques:

→ Immediate Addressing: The simplest form of addressing is immediate addressing.



→ Direct Addressing: A very simple form of addressing is direct addressing. It requires only one memory reference, and no special calculation.

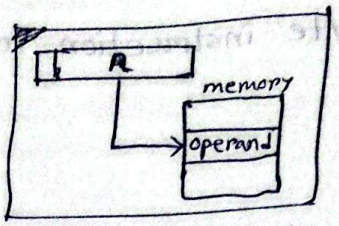
→ Indirect Addressing: With direct addressing the length of the address field is usually less than the word length. Thus limiting the address range.



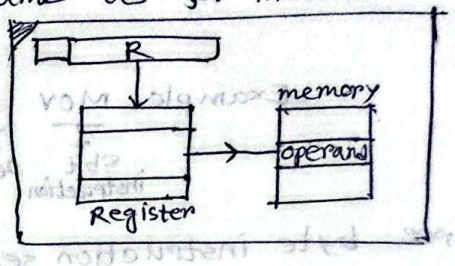
A = content of an address field in the instruction

R = Content of an address field in the instruction refer to a register.

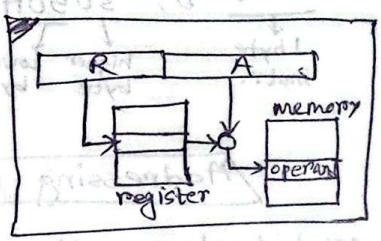
→ Register Addressing: It's similar to direct addressing but main difference is that the address field refer to a register rather than main memory.



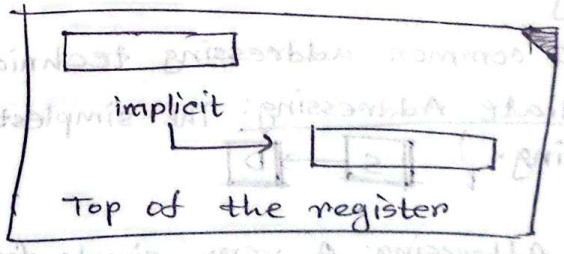
→ Register Indirect: ~~Register indirect~~ limitation of register indirect addressing are basically the same as for indirect addressing.

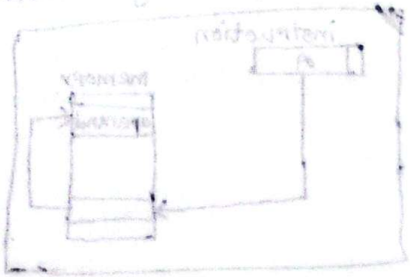


→ Displacement Addressing: A very powerful mode of addressing. Combines the capabilities of direct addressing and register indirect addressing will refer as displacement addressing.



→ Stack addressing: The final addressing mode that we consider is stack addressing.





23/06/2025 - C.A.

Types of Instructions

In general, instructions available in a computer may be broadly classified into five groups:

→ Data transfer instruction
→ Arithmetic "
→ Logical "
→ Program control "
→ I/O "

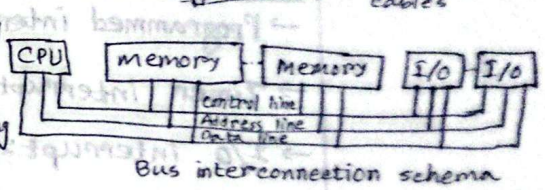
Difference betn RISC & CISC processor

RISC	CISC
1. RISC means reduce instruction set computer.	1. CISC means complex instruction set computer.
2. The instructions have fixed format.	2. The instruction have variable format.
3. It has simple addressing mode.	3. It has complex addressing mode.
4. Clock rate 50-100MHz	4. Clock rate 33-50MHz.
5. Executes at least one instruction by a cycle.	5. Several cycle may require to execute one instruction.

2nd Chapt. COMPUTER SYSTEM

System Buses

BUS: A bus is a communication pathway connecting two or more devices. Basically a bus consists of multiple communication pathway or lines. Each line is capable of transmitting signals representing binary 1 and 0.



Bus interconneetion schema

System BUS: A bus that conneets major computer components (processor, memory, I/O) is called system BUS. System BUS consists of data, address, and control.

Data BUS: The data bus provide a path for moving data between system modules. These lines collectively are called the data BUS. Data BUS typically consists of 8, 16, 32 square lines.

25/06/25 →

Address BUS: The address lines are used to designate the source or destination of the data on the data bus. The address bus determines the maximum possible memory capacity of the system.

Control Bus: The control lines are used to control the access to and the use of the data and address lines control signal transmit both command and timing information between system control lines included some task.

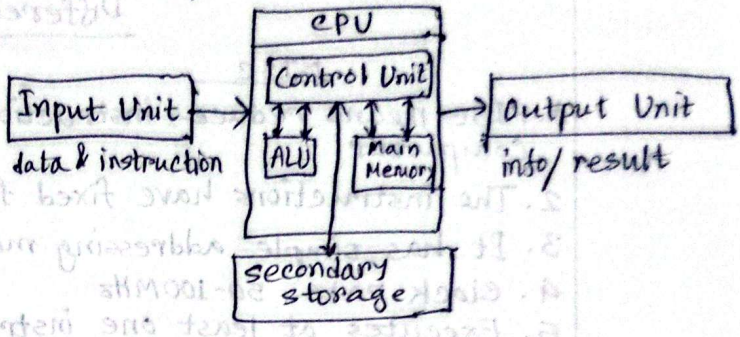
↳ Memory write: causes data on the bus to be written into the addressed location
↳ Memory read: " " from the addressed location to be placed on the bus.
↳ I/O write: " " on the bus to be output to the addressed I/O port
↳ Transfer: Indicate that data have been accepted from or placed on the
↳ Bus request: " " module needs to gain control of the bus.

↳ Bus grant: " " a request module has been granted control of the bus.
↳ Interrupt request: " " an interrupt is pending
↳ Clock: Used to synchronize operation
↳ Reset: Initialization all module.

Computer system components and functions

There are basically three important components of the computer system

→ Input Unit
→ Central Processing Unit (CPU)
→ Output Unit.



Interrupt: An interrupt is a signal to the processor emitted by hardware or software indicating an event that needs immediate attention.

Classes of interrupts:

→ **Programmed interrupt:** Generated by some condition that occurs as a result of an instruction execution.
→ **Timer interrupt:** It is generated by a timer within the processor this system perform on a regular basis.
→ **I/O interrupt:** Here generated an I/O controller signal to completion an operation
→ **Hardware failure interrupt:** Its generated by failure such as power, memory failure/error.

25/04/25 - FBS

Difference betn Business, Trade, and Commerce.

Objective of Business

(i) Economic objectives: (a) earning profit
(b) creating customer
(c) innovation

(ii) Social objectives: (a) supplying desired goods/services
(b) fair salery
(c) employment generation

(iii) Human objectives: (a) labour welfare
(b) participate management
(c) payment of govt. tax

(iv) National objectives: (a) optimum utilization of resources
(b) national self reliance
(c) development of backward area

Types of Business;

(i) Sole propritorship: (a) Easy formulation
(b) unlimited liability
(c) profit own
(d) management own
(e) easy dissolution

(ii) Partnership (2 to 20 people): (a) legality
(b) profit & loss distribution
(c) management
(d) transfer of rights

(iii) Joint stock company: (a) creation of law
(b) limited liability
(c) common seal
(d) number of members

(iv) co-operative society: (a) easy formulation
(b) limited liability
(c) equal rights
(d) mutual interest

(v) State enterprise:
(a) main motive: common people.
(b) only state is the owner
(c) have artificial entity

2/7/25 - CA.

Bus Interconnection

A bus is a communication pathway connecting two or more devices is called bus interconnection.

PCI bus system: The peripheral component Interconnection (PCI) is a popular high-bandwidth, processor independent bus that can function as a peripheral bus, compared with other common bus specialization PCL deliver better system performance for high speed I/O subsystem.

Characteristics of PCI: There are many important features of PCI bus.

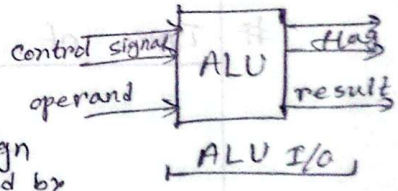
- **Signaling Environment:** supports 3.3 and 5volt signaling environment.
- **Reliability:** It offers the ability to replace modules without disturbing a system operation called as hot plug and hot swap.
- **Speed:** It can transfer upto 132 MB per second.
- **Configurability:** The ability to configure a systen automatically.
- **Synchronous bus architecture:** PCI is a synchronous bus where data transfer takes place according to systen clock.
- **32 and 64 bit addressing:** The PCI also support 64 bit addressing with the same 32 bit connector.
- **Large bandwidth:** It can handle both 32 as well 64 bit data hence the maximum bandwidth is 132 MB ps.

09/07/25 - CA.

Computer Arithmetic

The ALU is that part of the computer that actually performs arithmetic and logical operations on data.

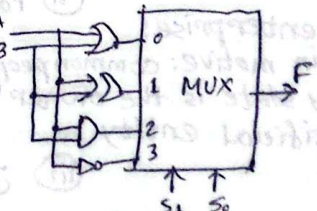
Note: All other elements of a computer system (control unit, register, memory, I/O) are mainly to bring data into ALU for it to process and then to take result back out.



ALU I/O

Design of ALU Logic ckt:

The simplest and most straightforward way to design a logic ckt, the diagram typical stage designated by subscript. The circuit must repeated 'n' time for an 'n' bit logic ckt. Therefore generate the four logic operation OR, XOR, AND, NOT. the two selection variable in the multiplexer select of the gate for the output.



S_1	S_0	Output	Operation
0	0	F=A+B	OR
0	1	F=A⊕B	XOR
1	0	F=A·B	AND
1	1	F=$\bar{A}$	NOT

Different types of numbers

- Integer representation (-∞ to +∞)
  - signed (-n to n) 0 (+ve), 1 (-ve)
    - SMR
    - 1's comp
    - 2's comp
  - unsigned (0 to N) (0 to $\infty^n - 1$)
- Real number representation
  - fixed
  - floating

7/7/25 - FBS

Question/Topic: The Role of business in socio economic derelopment of BD

(i) Supply of goods or services.
(ii) Harnessing capital and other resources in production.
(iii) Self employment and provision of employment.
(iv) Income generation.
(v) Interest in national income.

Qualities that makes a businessman successful

(i) Physical appearance
(ii) Education
(iii) Technical skill
(iv) Honesty
(v) Hard working
(vi) Dicipline
(vii) Decision power
(viii) Ability to plan
(ix) Management skill
(x) Innovative
(xi) Leadership qualities
(xii) Cooperative

Sole propritorship - important features:

(i) Capital
(ii) Easy dissolution
(iii) Easily transferable
(iv) Freedom of action
(v) Formation
(vi) Legal entity
(vii) Limited life
(viii) Legal restriction

some advantages of sole propritorship

(i) Easy formation
(ii) Entire profit
(iii) Entire control
(iv) Flexibility
(v) Direct relationship with workers
(vi) Contact with customer
(vii) Easy transfer of ownership
(viii) Honest
(ix) Independence
(x) Saving in taxes
(xi) Secrecy
(xii) Social benefit
(xiii) Quick decisions.

Limitation or disadvantages of sole propritorship

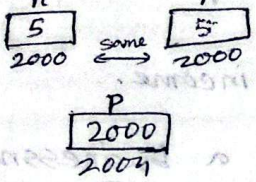
(i) Liability
(ii) Taxes
(iii) Lack of continuity
(iv) Difficulty of raising capital

03/07/25 - OOP

Reference variable:

syntax: data_or_class (type) &var_name;

```
int n=5;
int *p = &n;
int &r = n;
```



Scope resolution operator:

::

H.W.
prog: 3.1

08/07/25 - OOP

Lab
prog: 3.3

```
#include <iostream>
using namespace std;
int main(){
    int n;
    cout << "Enter the size of the array: ";
    cin >> n;
    int *a = new int[n];
    cout << "Enter array elements: ";
    for (int i=0; i<n; i++) cin >> *(p+i);
    int sum=0;
    for (int i=0; i<n; i++) sum += *(p+i);
    cout << "Sum = " << sum;
    return 0;
}
```

```
#include <iostream>
using namespace std;
int main(){
    int n, x, s=0;
    cin >> n;
    do {
        cin >> x;
        if (x%2 == 0) s += x;
    } while (--n);
    cout << s << endl;
    return 0;
}
```

7/7/25 - FBS

Partnership Business → দুই বা ততোধিক পার্টনার মিলে Profit আইনের সাথে চুক্তির লাভের আশায় যে ব্যবসা করে।

Elements of partnership Business:

(i) Contract
(ii) Association of two or more persons
(iii) Carrying on of business.
(iv) Sharing of profit.
(v) Mutual agency.

Types of partner available in partnership business.

1. General/or Active partner.
2. Inactive partner.
3. Nominal partner.
4. Limited partner.
5. Partner in profit only
6. Secret partner
7. Partner by disposal
8. Quasi partner.

Elements of partnership deed. → চুক্তিনামা

(i) Name and address of the firm
(ii) Name and address of the partners
(iii) Nature of business
(iv) Profit sharing ratio
(v) Capitals of the partners
(vi) Interest on capital
(vii) Amount of drawings → withdraw
(viii) Salary
(ix) Loan from partner
(x) Bank account
(xi) Books of account
(xii) Duration of partnership
(xiii) Rule of retirement
(xiv) Goodwill
(xv) Audit of account
(xvi) Settlement of disputes
(xvii) Application of Garner & Murray decision

```c
#include <stdio.h>
int main(){
    int UB=5, LB=0;
    int LA[UB]={1,3,2,5,4};
    int K = LB;
    while (K < UB){
        Printf("%d\n", LA[K]);
        K = K+1;
    }
    return 0;
}
```

```c
#include <stdio.h>
int main(){
    int LB=0, UB=5;
    int LA[UB]={1,3,2,5,4};
    for(int K=LB; K<UB; K++){
        printf("%d\n", LA[K]);
    }
    return 0;
}
```

```c
#include <stdio.h>
void INSERT(int *LA, int N, int K, int ITEM){
    int J = N-1;
    while (J > K){
        LA[J+1] = LA[J];
        J = J-1;
    }
    LA[K-1] = ITEM;
    N = N+1;
}
```

insept

```c
void DELETE(int *LA, int N, int K, int ITEM){
    ITEM = LA[K-1];
    for (int J=K-1; J < N-1; J++){
        LA[J] = LA[J+1]
    }
    N= N-1;
}
```

Delete

$Q_0 = \Lambda$ $Q_1 = a$ $Q_2 = aa$

7/8/25 – ODE · Linear differential equation

⑥ $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$

$\Rightarrow \frac{dy}{dx} + \frac{y}{1+x^2} = \frac{e^{\tan^{-1}x}}{1+x^2}$ —①

Integrating factor (I.F) $= e^{\int \frac{1}{1+x^2}dx}$

$= e^{\tan^{-1}x}$

Multiplying ① by I.F.

$e^{\tan^{-1}x}\frac{dy}{dx} + \frac{ye^{\tan^{-1}x}}{1+x^2} = \frac{e^{\tan^{-1}x}}{1+x^2}e^{\tan^{-1}x}$

$\Rightarrow \frac{d}{dx}(ye^{\tan^{-1}x}) = \frac{e^{2\tan^{-1}x}}{1+x^2}$

$\Rightarrow \int d(ye^{\tan^{-1}x}) = \int \frac{e^{2\tan^{-1}x}}{1+x^2}$

$\Rightarrow ye^{\tan^{-1}x} = \int e^{2z}dz$

Put, $\tan^{-1}x = z$, $\frac{1}{1+x^2}dx$

⑥ $\frac{dy}{dx} + y\cot x = 2\cos x$ —①

I.F $= e^{\int \cot x\,dx} = e^{\ln \sin x} = \sin x$

mul ① by I.F

$\sin x\frac{dy}{dx} + y\cot x \sin x = 2\cot x \sin x$

$\Rightarrow \sin x\frac{dy}{dx} + y\frac{\cos x}{\sin x}\cdot\sin x = \sin 2x$

$\Rightarrow \sin x\frac{dy}{dx} + y\cos x = \sin 2x$

$\Rightarrow \frac{d}{dx}(y\sin x) = \sin 2x$

$\Rightarrow \frac{d}{dx}(y\sin x) = \sin 2x$

$\Rightarrow \int d(y\sin x) = \int \sin 2x\,dx$

$\Rightarrow y\sin x = -\frac{\cos 2x}{2} + c$ (Ans)

7(i) $\frac{dy}{dx} + \frac{y}{x} = x^2$

I.F $= e^{\int \frac{1}{x}dx} = e^{\ln x} = x$

mul ① by I.F

$x\frac{dy}{dx} + \frac{xy}{x} = x^3$

$\Rightarrow x\frac{dy}{dx} + y = x^3$

$\Rightarrow \frac{d}{dx}(yx) = x^3$

$\Rightarrow \int d(xy) = \int x^3$

$\Rightarrow xy = \frac{x^4}{4} + c$ (Ans)

7(ii).

$xy = \frac{x^4}{4} + c$ —①

Given initial condition $y(1) = 1$

$1.1 = \frac{(1)^4}{4} + c$

$\Rightarrow c = 1 - \frac{1}{4} = \frac{4-1}{4} = \frac{3}{4}$

Putting the value of c in ① we get

$xy = \frac{x^4}{4} + \frac{3}{4}$ (Ans)

⑧ $\cos^2 x\frac{dy}{dx} + y = \tan x$

$\Rightarrow \frac{dy}{dx} + \frac{y}{\cos^2 x} = \frac{\tan x}{\cos^2 x}$

$\Rightarrow \frac{dy}{dx} + y\sec^2 x = \tan x\sec^2 x$ —①

I.F $= e^{\int \sec^2 x\,dx} = e^{\tan x}$

mul ① by I.F.

$e^{\tan x}\frac{dy}{dx} + ye^{\tan x}\sec^2 x = \tan x\, e^{\tan x}\sec^2 x$

$\Rightarrow \frac{d}{dx}(ye^{\tan x}) = \tan x\, e^{\tan x}\sec^2 x$

$\Rightarrow \int d(ye^{\tan x}) = \int \tan x\, e^{\tan x}\sec^2 x\,dx$

$\Rightarrow ye^{\tan x} = \int ze^z dz$

Put $\tan x = z$, $\sec^2 x\,dx = dz$

$\Rightarrow ye^{\tan x} = z\int e^z dz - \int\{\frac{d}{dz}(z)\int e^z dz\}dz$

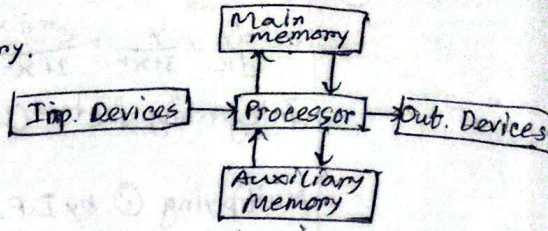
$\Rightarrow ye^{\tan x} = ze^z - \int 1.e^z dz$

$= ze^z - e^z + c$

$\Rightarrow ye^{\tan x} = \tan x\, e^{\tan x} - e^{\tan x} + c$ (Ans)

21/07/25 - C.A.

Auxiliary Memory



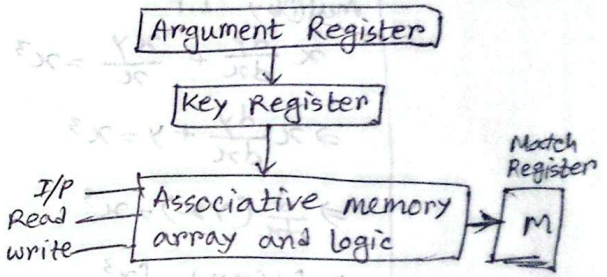
•Auxiliary memory is also called a secondary memory. It is used to store large amount of data at a lesser cost per byte than a primary memory for backup. •It doesn't loss data when the device is powered down (non volatile).
•Its not directly accessible by the CPU, they are accessed via the I/O channel. •The most common form of auxiliary memory device used in consumer system is flash memory, optical disk, magnetic disk, magnetic tapes e

Flash Memory

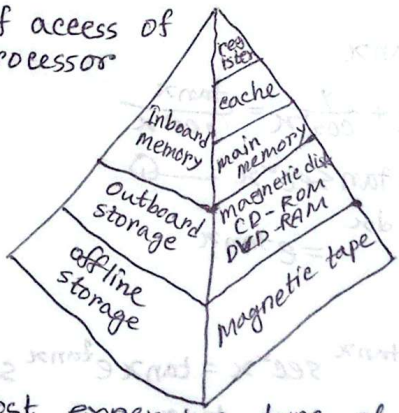
Flash memory is a type of non-volatile memory that erases data in units called blocks. A block stored on flash memory chip must be erase before data can be written. It is used in many consumer electronic prod

Associative Memory

The memory unit in which the storage locations are identified by their content or by part of their contents rather than by position is ass. mem



Memory Hierarchy: a typical hierarchy is illustrated in order
(i) Decreasing cost per bit
(ii) Increasing capacity
(iii) Increasing access time
(iv) Decreasing frequency of access of the memory by the processor



→ Fastest, smallest and most expensive type of memory consists of the register internal to the processor. Typically a processor will contain a few dozen such registers, although some machine contains hundreds of them
→ Level two main memory is the principle internal memory system of the computer. each location in main memory has a unique addres
→ Main memory is usually extended with a high speed smaller cache memory, the cache is not usually visible to the programmer to the processor.

Logo concept "CD"

21/07/25 - FBS

State enterprise → সরকার যে ব্যবসায় involve থাকে (WASA, TCB)

Fields of state enterprise:
(i) Defensive industries
(ii) Monetary business
(iii) Rare & valuable product
(iv) Harmful product
(v) Most valuable product
(vi) Unlimited expense
(vii) Life saving product

Entrepreneur (উদ্যোক্তা) & Entrepreneurship (উদ্যোগ)

Business environment → যে পরিবেশে বাজার, ব্যবসা, অর্থনীতি, ... থাকে

Importance of Business environment
(i) Determining opportunities & threat
(ii) Giving direction of growings
(iii) Continuous learning
(iv) Image building
(v) Meeting competition
(vi) Identifying Firms strengths & weaknesses

Types of business environment
- economic environment
  - economic conditions
  - economic policies
    - Industrial policy
    - Fiscal policy
    - Monetary "
    - Foreign direct investment "
    - export & import "
  - economic systems
    - capitalism
    - socialist
    - mixed economy
- non-economic environment
  - social environment
  - political "
  - legal "
  - technological "
  - demographic "
  - natural "

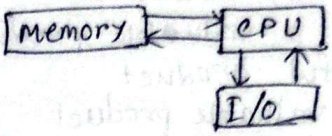
Why should business perform social responsibilities?
(i) Public image
(ii) Government Regulations
(iii) Survival & growth
(iv) Employee satisfaction
(v) consumer awareness

11/08/2025 - Comp. Arch.

I/O organization

Data transfer between the CPU and I/O device may handle various modes

i) Programmed I/O
ii) Interrupted I/O
iii) DMA (Direct memory Access)



I/O module function: The major functions or requirements for an I/O module falls into the following categories:

* Control and timing
* Processor communication
* Device communication
* Data buffering
* Error detection

The I/O function included a control and timing requirement to coordinate the flow of data from resources and external devices. The I/O modules must communicate with the processor, with the external device, and it must be able to perform device communication which involves commands, status information, and data. An essential task of an I/O module is data buffering. Finally an I/O module often responsible error detection and subsequentially reporting errors to the processor.

I/O commands: To execute an I/O related instruction, the processor issues an address, specifying the particular I/O module and external device and I/O command. The four types of I/O command that I/O module may receive when it is addressed by processor are:

→ Control: Used to activate peripheral and tell it to do.
→ Test: Used to test various status condition associated with an I/O modules and its peripherals.
→ Read: Causes the I/O module to take an item data from the data bus and subsequently transmit that data item to peripherals.
→ Write: Causes the I/O module to obtain an item of data from the peripherals and place it an internal buffer.

11/02/25 - DS

Implementation of Linked List:

```
struct Node {
    int data;
    struct Node* next;
};

struct Node* createNewNode(int data, struct Node* next){
    struct Node* newNode = (struct Node*) malloc(sizeof(struct Node));
    newNode -> data = data;
    newNode -> next = next;
    return newNode;
}
void printLinkedList(struct Node* head){
    struct Node* currentNode = head;
    while (currentNode != NULL){
        printf("%d ", currentNode -> data);
        currentNode = currentNode -> next;
    }
    printf("\n");
}
int countNumOfElements(struct Node* head){
    struct Node* currentNode = head;
    int count = 0;
    while (currentNode != NULL){
        count++;
        currentNode = currentNode -> next;
    }
    return count;
}
```