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- 8808137241

Textbooks

→ Ulman

→ John c. martin

→ Petey Linz

→ Michael.

Syllabus.

1. Finite Automata

2. Regular Expression & Regular language

3. Grammar

4. Push down Automata

5. Turing machine

6. Undeciability.

Input Alphabet: There is no prescribed definition for input alphabet but it must have finite no. of elements.

Eg: $\Sigma = \{a, b, c\}$

$= \{0, 1\}$

$= \{+, -, *, \div\}$

String: A string is any finite combination of input alphabets.

Eg: Given Alphabet = $\Sigma = \{a, b\}$

Strings: a, aa, aaa, aaaa, ...

abab, ...

but (ab.... Infinite) is not a string.

Operation on string:

1) Length of the string: The no. of symbols in the string

Ex: $\Sigma = \{a, b, c\}$

0-length string: is only ϵ (Epsilon)

Cardinality of $= |\epsilon| = 0$

$|w| = 1$
a, b, c
$|w| = 2$
aa, ab, ac, bb ...

Cardinality = length of string = no. of Symbol in string.

The no. of strings of length '0' is $|\Sigma|^0 = 3^0 = 1$

" " " " " '1' is $|\Sigma|^1 = 3^1 = 3$

" " " " " '2' is $|\Sigma|^2 = 3^2 = 9$

" " " " " 'n' is $|\Sigma|^n = 3^n$

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12-July-2023

Programming and Data structures -

Avg marks - 13 marks

I. Programming

- Basics (operators, loops, switch, function)
- storage classes, scope
- pointers, strings -----> Pointers
- Arrays
- structures, unions
- Recursion
- Dynamic memory allocation

  → Basics
  → pointer to pointer
  → pointer to array
  → array of pointers
  → pointers to strings
  → multidimensional arrays
  → pointer to function,

II. Data Structures

- Linked lists
- Stack
- Queue
- Trees (BST, AVL)
- Hashing

Reference Text Books -

Structure

- 'C' Language by Dennis Ritchie
- 'C' Test your aptitude by Venugopal and N. Chandrakantt
- D.S. by Sahani
- D.S. by mark Allen Weiss

I- PROGRAMMING

Operator	precedance	associativity
( )	1 (high)	L → R
↑	2	R → L
* / %	3	L → R
+ -	4	L → R
=	5 (low)	R → L

Associativity : If two or more operators are having same precedance then exp^n will be evaluated using associativity.

Expression	Result
5/2	2
5.0/2	2.5
5.0/2.0	2.5
2/5	0
2.0/5	0.4
2.0/5.0	0.4

NOTE :

If both are integer then O/P will be integer. And, if any one is float then O/p will be float

Expression	assigned to int	assigned to float
5	5	5.0
5.0	5	5.0
5/2	2	2.0
5.0/2	2	2.5
5.0/2.0	2	2.5
2/5	0	0.0
2.0/5	0	0.4
2.0/5.0	0	0.4

Relational and logical operators:

- All the relational and logical operators returns 1 or 0.
  If the expression is true => returns 1
  If the expression is false => returns 0
- All non-zero is considered as true and zero is considered as false.

i) a = $\underbrace{5 > 4}_{\text{TRUE}}$ => a = 1

ii) a = $\underbrace{(5 > 4)}_{\text{TRUE}} + \underbrace{(3 > 2)}_{\text{TRUE}}$ => a = 2

iii) a = $\underbrace{5 > 4}_{\text{TRUE}} > 3$; => a = 0

= $\underbrace{1 > 3}_{\text{false}}$

TRUE	FALSE
-10	0
20	0.0
1.5	\0
-0.6	NULL
30.6	

modulus Operator: (%)

i. 15 % 7 = 1

ii. -15 % +7 = -1

iii. +15 % -7 = 1

iv. -15 % -7 = -1

v. $-15.5 \;\%.\; +7$ = error

vi. $+15.5 \;\%.\; -7$ = error

vii. $-7 \;\%.\; +15 = -7$

viii. $+7 \;\%.\; -15 = +7$

NOTE -

- Modulus always gives numerator sign.
- Modulus doesn't work on float values. It works only on integers
- If the value is small without sign, then it gives the same value as the O/p.

i. $15.0 / 2 * 2 \;\%.\; 7$

$7.5 * 2 \;\%.\; 7$

$15.0 \;\%.\; 7$ = error

ii. int a = $2 * 3/4 + 2.0/5 + 3/5$

$6/4$

1 + 0.4 + 1

int a = 2.4 then a = 2

printf("%d", a) = 2

iii.
```
void main()
{
  int a = 5;
  if (a = 8)   = Then true
  {            assignment
    printf("Hello");
  }
  else
  {
    printf("Bye");
  }
  printf("%d", a);
}
```

a 8

O/p:

Hello 8

NOTE -

Assignment operator assigns the value and returns assigned value.

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Probability

Random Experiments:- When even we are not sure about the outcome of an experiment then such type of experiments are called random experiment. Coin tossing
Throwing a dice.
A baby is going to take birth.

Sample space:- Total no. of possible outcomes written in set form is called as sample space.

Coin : $S_C = \{H, T\}$
Dice : $S_D = \{1, 2, 3, 4, 5, 6\}$
family : $S_F = \{B, G, T\}$

Event:- Any subset of an sample space is known as event

NOTE⇒ Total no. of event associated with sample space 'S' having cardinality 'n' = Total no. of subsets $= 2^n$

Eg $S_C = \{H, T\} \Rightarrow$ Total no. of subsets $= 2^2 = 4$

various events : $E_1 = \{H\}$ $E_2 = \{T\}$

$E_3 = \{H, T\} = S$ = sure event $E_4 = \phi$ ← Impossible event

Sure Event / Certain event:-

$\because S \subseteq S$, So, it is also an event & it is called sure event

$\therefore \boxed{P(S) = 1}$

Impossible Event:- $\because \phi \subseteq S$, So ϕ is also an event and it is called impossible event.

$\therefore \boxed{P(\phi) = 0}$

NOTE:-

1) $0 \leq P(E) \leq 1$

2) Prob. : Base = 1 unit
   Proportion : ⇒ Base = 1 unit
   % ⇒ Base = 100 unit

2) P(given that) = 1

3) P(something occurres) = 1

4) P(Nothing occurns) = 0

5) P(Death) = 1

6) P(GOD) = 1

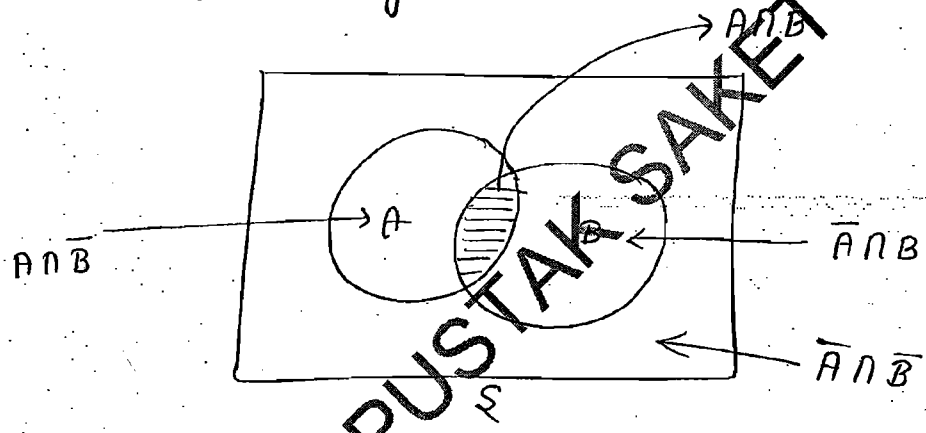
7) In this Coplen we will use fallowing notations:

(a) Either A or B or Both = At least one of A or B = $A \cup B$

(b) Both A and B = simultaneous occurrence of A & B = $A \cap B$

(c) Neither A Nor B = None of A & B = $\bar{A} \cap \bar{B}$

(d) $\underbrace{A \cap \bar{B}}_{\text{only A}} + \underbrace{\bar{A} \cap B}_{\text{only B}} + \underbrace{A \cap B}_{\text{Both}} = A \cup B$



8) Some standard Results:-

(i) (addition Theorem) ⇒ $\boxed{P(A \cup B) = P(A) + P(B) - P(A \cap B)}$

$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$

ii) Multiplication Theorem ⇒

$$\boxed{P(A \cap B) = P\left(\frac{A}{B}\right) \cdot P(B)}$$

conditional prob
This is prob. of A when B is already happen

iii) P(Neither A nor B) = 1 − P(either A or B or Both)

$$\boxed{P(\bar{A} \cap \bar{B}) = 1 - P(A \cup B)}$$

iv) again we can write,

$P(\text{either A or B}) = 1 - P(\text{neither A nor B})$

$P(\text{atleast one of A or B}) = 1 - P(\text{None of A \& B})$

In short, $\boxed{P(\text{atleast one}) = 1 - P(\text{None})}$

9) Mutually exclusive Events:—

A and B are said to be mutually exclusive if they can not occure simultaneously.

i.e $A \cap B = \phi \rightarrow P(A \cap B) = 0$

$\boxed{P(A \cup B) = P(A) + P(B) - 0}$

Eg Dice: $S = \{1, 2, 3, 4, 5, 6\}$ → $A = \{1, 3, 5\}$

→ $B = \{2, 4, 6\}$

$\therefore A \cap B = \phi$ So, A and B are M.E.

Independent Events: If occurrence or non-occurrence of one event donot alter the occurrence or non-occurrence of other events then Events are called independent.

And in case of independent events " we can multiply the respective probability in order to find their simultaneous probability.

i.e if A & B are independent then $\boxed{P(A \cap B) = P(A) \cdot P(B)}$

or if A, B, C are independent then $P(A \cap B \cap C) = P(A) \cdot P(B) \cdot P(C)$

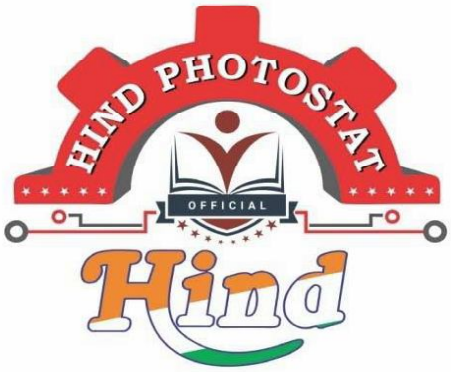
Que: A coin is tossed and a dice is thrown then find the probability that head will come on coin and the no. less than 5 comes on dice?

$C = \{H, T\}$ $D = \{1, 2, 3, 4, 5, 6\}$

$E_1 = \{H\}$ $E_2 = \{1, 2, 3, 4\}$

$P(E_1) = \frac{1}{2}$ $P(E_2) = \frac{4}{6} = \frac{2}{3}$

$P(E_1 \cap E_2) = \frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$ (∵ Dice & coin are independent ⇒ E_1 & E_2 are also Indepen.)



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DIGITAL LOGIC [5-8 Marks]

Boolean Algebra

$r = 2$ { Binary Number System }

{0, 1}

B. Variables ⇒ A, B, C, ...
a, b, c, ...

Operators ⇒ {OR, AND, NOT}

Algebra

$r = 10$ {0, 1, 2, ... 9}

SYLLABUS

** (ii) (2024) Boolean Algebra

- Boolean Variables
- Boolean operators → Basic Operators { OR, AN, NOT }
  → Derived Operators { NAND, NOR, EX-OR, EX-NOR }
- Boolean Algebra Properties
- SOP, POS
- Universal logic Gates
- Simplification of Boolean Expressions or Boolean functions using properties
- Realising ~~it~~ or BF using minimum of NAND gates or min. no. of NOR gates.
- EX-OR & EX-NOR Relations.

(ii) Number System:

- $(\ )_{r1} = (\ )_{r2}$

eg. $(\ )_{10} = (\ )_8 = (\ )_2 = (\ )_4 = (\ )_6$

- (r-1)'s or r's complement
- Signed Binary Number system
- Range of Numbers in Signed Binary No. System.

(iii) K-Map :

- Implicant, Prime implicant, Essential PI
- Dont Care combinations
- Reading Minimal Expressions using K-Maps. (SOP or POS).

(iv) Combinational Circuits :

Digital circuits → Combinational circuit, Sequential circuit

Code converters ⇒ BCD to E3
E-3 to BCD.
Binary to Gray code, etc.

Arithmetic Circuit ⇒ Half Adder, Full Adder
Half Subtractor, Full Subtractor
Binary Adder, Binary Subtractor
BCD Adder, BCD subtractor
Magnitude comparator
Multiplexer, De Multiplexer.
Encoder, Decoder, Priority Encoder

(v) Sequential Circuits

- Binary Latch, Flip-Flops (FF)
- Conversions ⇒ FF1 → FF2
  DFF → J-K FF
  D FF → T FF
- Registers
- Counters → Asynchronous Counter (Asynchronous)
  → Synchronous Counter (Synchronous)

Book:
Modern Digital Electronics
– ~~RJain~~ R.P.Jain

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BOOLEAN ALGEBRA

Binary Operaters: OR, AND

Unary Operater: NOT.

Basic operaters: {AND, OR, NOT}

(i) OR: ⇒ + , U, V

$Y = A \cup B = A + B = A \vee B$

$Y = A + B + C + \cdots$

	A	B	A+B	AB
0	0	0	0	0
1	0	1	1	0
2	1	0	1	0
3	1	1	1	1

$n = 2 \Rightarrow 4$

	A	B	C	A+B+C	ABC
0	0	0	0	0	0
1	0	0	1	1	0
2	0	1	0	1	0
3	0	1	1	1	0
4	1	0	0	1	0
5	1	0	1	1	0
6	1	1	0	1	0
7	1	1	1	1	1

$n = 3 \Rightarrow 8$.

Stmt: The result of operation is zero if and only if all the variables are zero.

Truth Table:

n 2^n Rows

$\{0, 1, 2, \ldots, (2^n - 1)\}$

Hardware components:

Logic gates

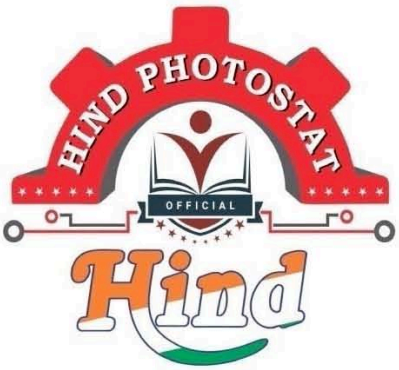
Integrated circuit (IC)

↳ Using PN Junction Diode

Transistors → BJT, FET

'OR' GATE:

Logic gates are available for any no. of inputs.



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Algorithm

Algo + DS = 20 to 25 marks

Syllabus :-

1. * Asymptotic Analysis
   * Time complexity and space complexity of Recursive Algo | Non Recursive Algorithm
   * Methods to solve Recurrence Relations.

(4-6 marks)

2. Algo Design Techniques.

   i) Divide and conquer
   ii) Greedy Method
   iii) Dynamic programming

(6-8 marks)

3. Data structures : * Tree and Graph Representation
   ** Priority Queue [Min Heap | max Heap]
   * Set Algorithm (union / find Algo)

(2 marks)

4. Sorting Algorithm
5. Tree and Graph Traversal Algo.

(2-4 marks)

Reference

*** DS & Algo using "C" Mark Allen weiss

Algorithm (Sartaj Sahani)

Introduction to Algo (coreman) [Ex problems].

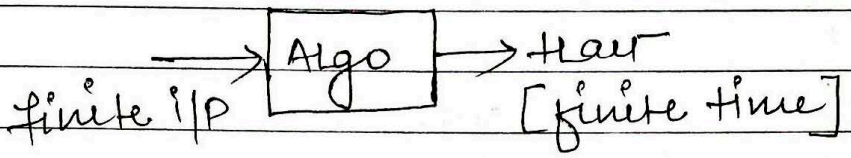
Date ___/___/_____ Page No.:_____

Introduction:—

Algorithm:
Step by step representation of computer program.

Criterias of Algo:—

1. Finiteness :— Algo must terminate in finite amount of time.



2. Definiteness :— Each step of Algorithm must have unique solution.
(also called Deterministic Algo).

3. Efficiveness :— Each step of Algorithm must be basic.

Deterministic Algo :—

Each step in Algo must have only unique solution.

∥ possible to implement in computers.

DFA : (90) —i/p→ (91)
unique.

⇒ All loop or If use in a are deterministic Algorithm.

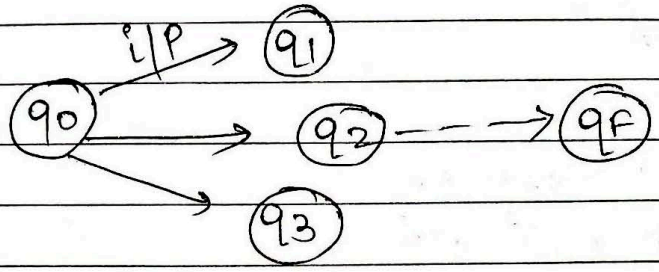
Maharaza

Date __/__/_____ Page No.: _____

Non Deterministic Algo || not possible to implement in compu

Each step in Algo can have finite # of solutions. ~~If~~ Algo should choose correct solution in first attempt.

NFA :



a[1 .... n] array ~~if~~ x is searching element.

Deterministic Algo :

```
for (i=1 ; i<=n ; i++)        # of comp = n
  {
    if (x == a[i])
        return (i)
  }
return (-1)
```

Non Deterministic Algo

```
i = choose (1, n)
if (x == a[i])
        return (i);
else
        return (-1);
```

} faster

# of comparison = 1

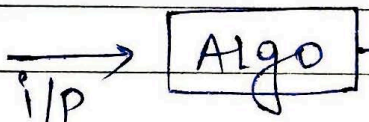
Date __/__/____ Page No.: ____

=) Step to Design Algo :-

1e Device Algo.
Design Algo using best Design technique

- Divide and conquer
- GM
- DP
- Bruteforce
- Backtracking.

2. Validation of Algo.
Test logic of Algo correct or not



3. Analysis of Algorithm : estimation of cpu execution time and main memory space to complete execution of algorithm.

4e Testing of program :- test program for all possible i/p's by using system testing method. [Testing tools]

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BY-SRINIWAS SIR

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

Topics

① Set theory (4 marks) (36 hrs)

- Sets
  - powerset
  - Venn diagram
  - multiset
- Relations
  - types of Rel^n
  - Partial order
  - Lattice
- function
  - Types of fun^n
  - fun^n composition
- Groups

② Combinatorics (15 Hrs) (2 marks)

- Counting
  - principle of inclusion & Exclusion
  - Euler's fun^n ($\phi(n)$)
  - Derangement (D_n)
  - permutation & Combination
  - pigeonhole principle
  - generating fun^n
  - Recurrence Relations → 100 Pages notebook
    i) Recursion - P
    ii) Compiler design

③ Graph Theory (10-12 hrs)

- Connectivity
- Matching
- Coloring

④ Mathmetical logic (8 hrs) (2 marks - 3 marks)

- Propositional logic
- first order logic

Set

- Collection of well defined unordered distinct object.

eg1. The collection of all tall boys in the class
→ It is not a set because we don't know that which height can treat as tall.
so, The coll^n of all tall boys whose height ≥ 165 cm, in the class it is a set.

eg2 How many of the foll^n sets are equal?

- The collection of all letters of "follow"
  $A = \{f, o, l, w\}$
- The coll^n of all letters of "flow"
  $B = \{f, l, o, w\}$
- The " " " " " "wolf"
  $C = \{w, o, l, f\}$

$\therefore A = B = C$

Null Set — The set which does not contain any element is called nullset.

- Denoted by ϕ or $\{\}$
- Cardinality of null set $|\underbrace{\phi}_{\text{null set}}| = 0 = |\{\}|$
- The set which contain ϕ as a element, the cardinality
  $|\underbrace{\{\phi\}}_{\text{set with a null element}}| = 1$

Subset → Let A, B are two sets if every element of 'A' is also an element of 'B' then we can say that

$A \subseteq B$ (A is subset of B)

Eg: $A = \{1, 2, 3\}$, $B = \{x \mid x \in N \ \& \ 1 \le x \le 5\}$
$= \{1, 2, 3, 4, 5\}$
$\therefore A \subset B$

$A \subseteq B$ — $A \subset B$ (OR) $A = B$

NOTE - If we know the B contain some extra element then we can write → $A \subset B$ (A is proper subset of B)

NOTE →

1. ϕ is subset of every set.
2. Every set is subset of itself

- Power Set : 10Q
- Venn diagram = 5Q

Power set → The coll^n of all possible subset of a given set is called power set.

- The power set of set 'A' is denoted by P(A)
- power set is set of sets

$A = \{a, b, c\}$ $n = 3$

$^3C_0$ $^3C_1$ $^3C_2$ $^3C_3$

$\{\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{c,a\}, \{a,b,c\}\}$

$^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n$

$|P(A)| = {}^3C_0 + {}^3C_1 + {}^3C_2 + {}^3C_3 = 2^3 = 8$

If $|A| = n$, then $|P(A)| = {}^nC_0 + {}^nC_1 + \dots {}^nC_n = 2^n$

Possibilities → ① 0/1 0/1 (x_1 x_2)

→	0	0
→	0	1
→	1	0
→	1	1

$4 = 2^2 = 2^n$ (n = no. of element) possibility

② 0/1/2 0/1/2 (x_1 x_2)

3 possibility of two elements $= 3^2$

③ 0/1 0/1 0/1 (x_1 x_2 x_3) $8 = 2^3$

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03-09-2023

Database Management System :

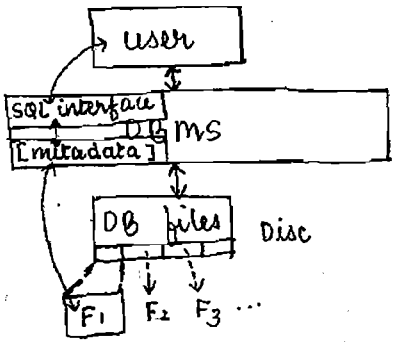
1. Integrity constraints and ER model 1-2 marks
2. Normalization 2-4 marks
3. Queries (relational algebra, SQL, relational calculus) 4 marks
4. File organization and Indexing (B / B+ Tree) 2-4 marks
5. Transactions and concurrency control. 2-4 marks

Reference Books -

1) DBMS - Raghuramakrishnan
2) DBMS - Navathe

→ Introduction :

- Database - structured collection of related data which is stored in computer system to access data when it is required.
- University DB students info, faculty info, course info etc. [collection of files]
- Database management system - application software to define, manipulate and access data from database.



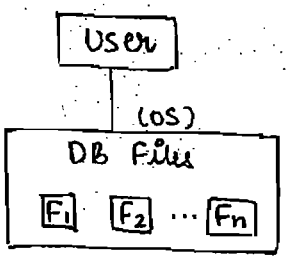
} Interface b/w user and DB files

- metadata - data about data
  - also called data dictionary
  - Format of file
  - Format of row and column
  - All storage info related to DB files

- Flat file System [OS files] - user manage database files without using DBMS.

- Small database is managed.

  Flat file system fails to manage huge DB.



OS Files : · txt
· csv

Limitations of Flat File System	Adv. of DBMS File System
i) Too complex to manage appn programs. complete info of the program should be managed by user. (· DBA · DB developer · end user)	i) Easy to develop appn programs because of data independency: (changes of file structure is not affected for user appn, user can use db files without knowing storage info)
ii) more I/O cost (and access cost) to access required data from db files	ii) less I/O to access required data from db files from using indexing.
iii) less degree of concurrency	iii) more degree of concurrency
iv) Too complex to maintain non-redundant data	iv) easy to maintain non-redundant data by using normalization.
v) Too complex to maintain different levels of access control.	v) By using views (virtual tables) can maintain different levels of access control.

→ Integrity constraints : based on RDBMS model

└→ correctness of data

· Data model - logical structure of DB files

- → RDBMS (in syllabus) : · is widely used
- → ODBMS · Codd's data model (By EF codd)
- → NWDBMS · Codd proposed 12 rules to design RDBMS software. (RDBMS guidelines)
- → Hierarchical DBMS

· RDBMS Guidelines -

i) data in db files must be in tabular format. (set of rows & cols)

ii) no two rows of the table should be same.

iii) Every RDBMS table must have atleast one candidate key.

iv) Every attribute of RDBMS table must be single valued (atomic)

Eg :

Sid	Sname	Cid ← multivalued attribute not allowed in RDBMS
S_1	A	$\{C_1, C_2\}$
S_2	B	$\{C_2, C_3\}$

v) Number of columns for each row and no. of rows for each col. must be same

vi) Name of one column is called attribute (or field)

vii) Name of one row is called record or Tuple

viii) Set of all records of the table is called relational instance (or snapshot)

Student

Sid	Sname	DOB
S_1	A	2000
S_2	B	2000
S_3	C	2002
S_4	D	2004

Attribute / field

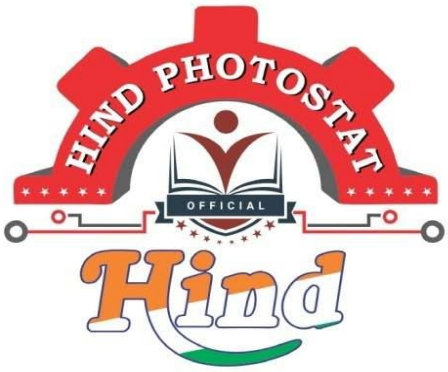
Tuple

relational instance

: Set of all records of DB Table

cardinality : 4

arity : 3



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Computer Network

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- Theory
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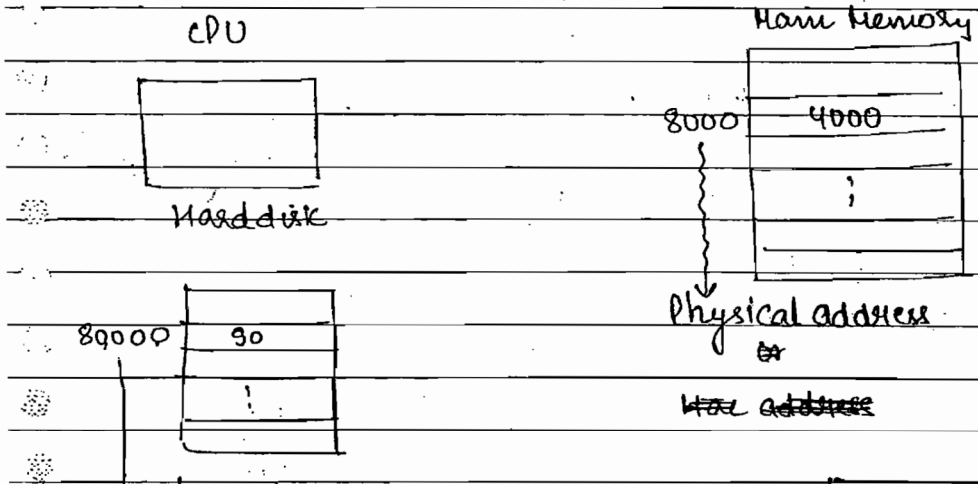
Computer Network and Security



MAC address is local, so cannot be used as unique identification Number

Physical address
(or)
Mac address
(or)
~~the~~ Ethernet address ⇒ 48 bit address
(or)
LAN card address
(or)
NIC card address

→ Implicit address

① S.A, D.A ② S.MAC, D.MAC — Scope is local

logical address (classful addressing)
32 bit address (IPv4)

IANA → Internet Assigned Number Authority

Note> Using MAC address alone cannot be used as an identification unit in transmitting the data, because scope is local

(IP) logical address → 32 bit address
Address
↓ classes → A, B, C, D, E — Research
Unicasting
multicasting

Page. No.
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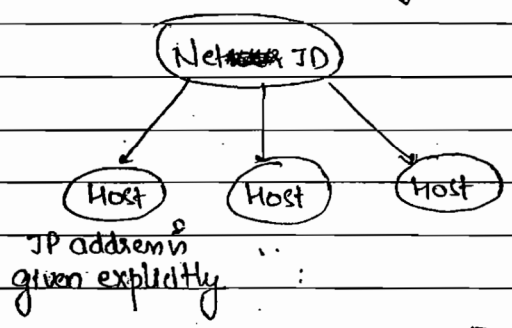
⊙ classful supports two level hierarchy.



www.yahoo.com
hostname

→ Whenever an IP address is assigned to a computer, it is known as host.

→ Entire Network will be represented by a number known as the Net ID.

Notation

i) Binary notation [2]

Ex- 10101111 10101010 10101111 11110000

System friendly. 1st octal 2nd octal 3rd octal 4th octal

ii) Dotted Decimal Notation [10]

Ex- 143.89.99.126 ⟶ User friendly.

⟶ In Binary notation starting few bits will decided the type of class

⟶ In dotted decimal notation, first octate will decided the type of class.

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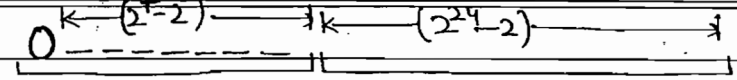
Class A>



Net bits 8bit — Host bits 24 bits

0 0000000 → 0

1111111 → 127

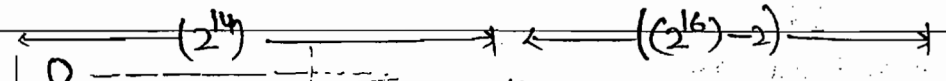
(0—127) but 0 and 127 not used

∴ (1—126) → Class A

0.0.0.0 → DHCP client

127.x.y.z → loop back address

Class B>



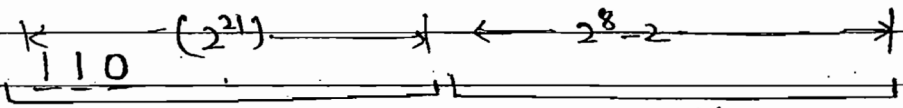
Net bits 16 bits — Host bits 16 bits

10 000000 → 128

10 111111 → 191

Class B Range → (128—191)

Class C



Net bits 24 bits — Host bits 8 bits

110 00000 → 192

110 11111 → 223

Class C Range → (192—223)

224
5
239

Page. No.
Date : / /

Class D — 1110 — no division — multicasting

1110 0000 → 224
1110 1111 → 239

Class D Range → (224–239)

Class E — 1111 — Research

1111 0000 → 240
1111 1111 → 255

Class E Range → (240–255)

Q) IP: 201.44.89.99

Net Id =

Direct Broad cast address of network =

Network mask (or Default mask)

Class A: 11111111.00000000.00000000.00000000
mask of A → 255.0.0.0
Class B: 255.255.0.0
Class C: 255.255.255.0

Mask → allowing and stopping

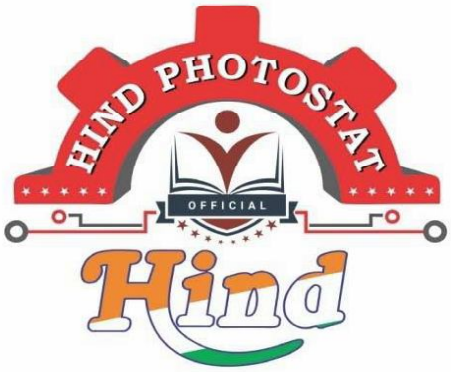
→ Network mask is a mathematical tool which is used for solving networking problems

IP: 201.44.89.99 (dec)
mask: 255.255.255.0
201.44.89.0 (And)

99: 01100011
01 00000000
01100000000

89: 01011001
255: 11111111
89: 01011001

x	y	output And
0	0	0
0	1	0
1	0	0
1	1	1



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Computer Organization

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Computer Organization

10 marks

Syllabus:

Module 1: computer architecture

Module 2: computer organization.

Ref Books: 1. computer architecture & organigization.
- Morris Mano. (Hardware design)

2. computer orgn.
- william stallings.

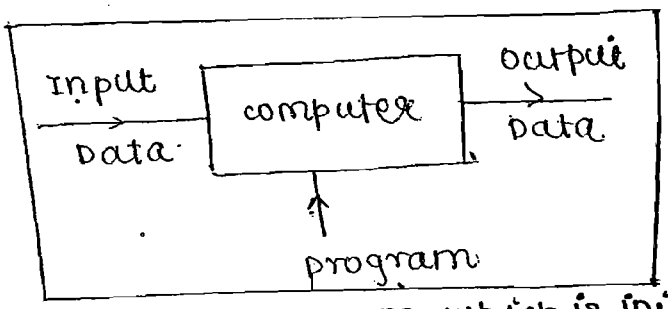
Faculty: Pingili Sagar.

email: sagar262003@yahoo.co.in.

Keywords:

computer:

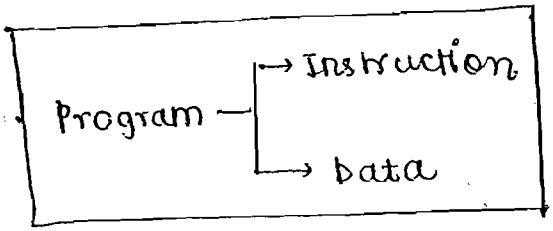
computer is a computational Machine used to process the data under the control of a application program. Therefore computer system functionality is program execution.



(program which is initiated by user)

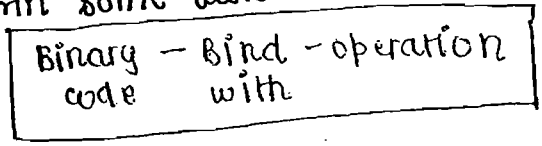
program:

Program is a sequence of instructions along with the data.



Instruction:

Instruction is a Binary code which is designed inside the processor to confirm some task.



Eg: If CPU – 'X' supports 8 different operation then opcode = $\log_2 8$ = 3bit

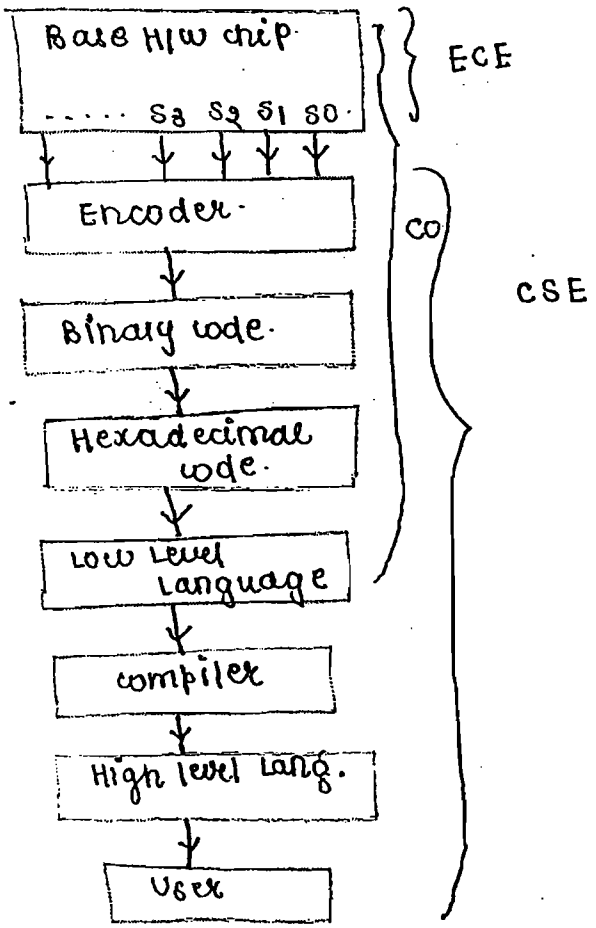
Binary code (opcode)	operation
000	+
001	–
010	*
⋮	⋮
111	AND

Decided by the designer → ROM → control unit

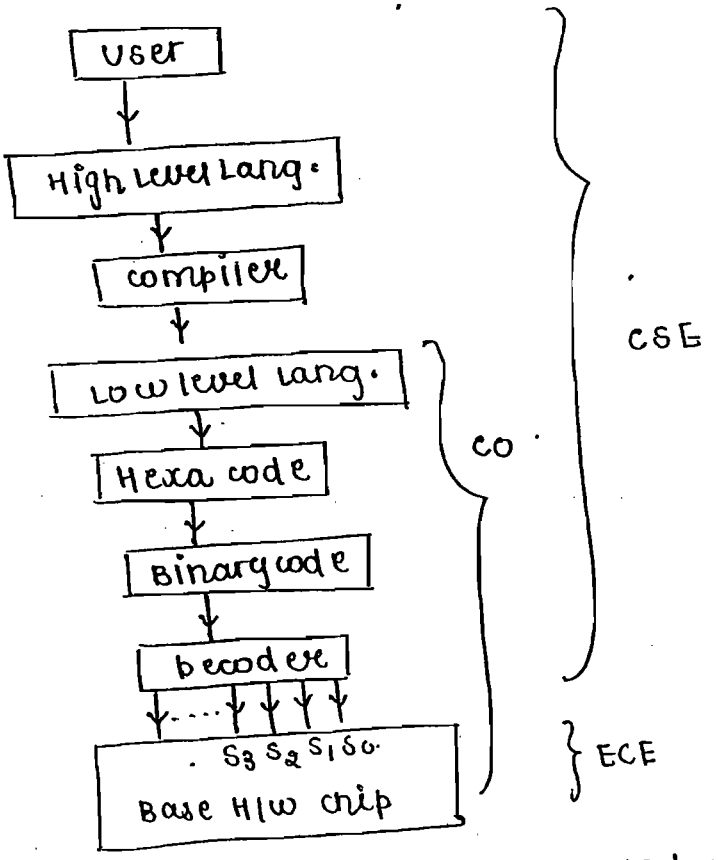
Encoding process: n signals given How many bits required to process signals $\log_2 n$.

Decoding process: n bits are given, How many operation can be performed by computer : '2^n' operation.

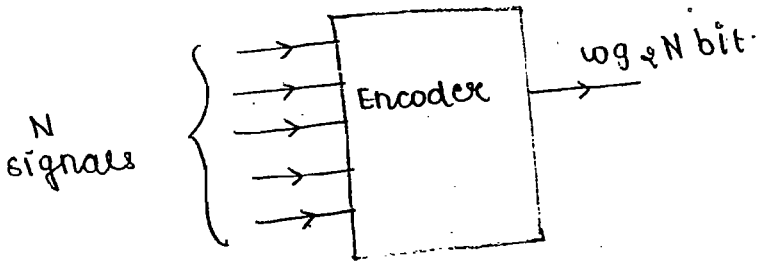
Designer view:



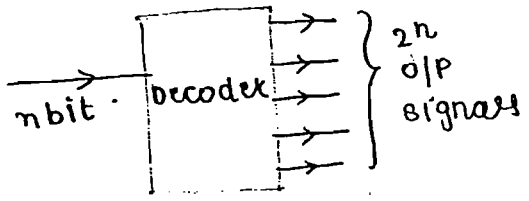
User View:



Encoding: In this process 'N' signals are represented using $\log_2 N$ bit format.



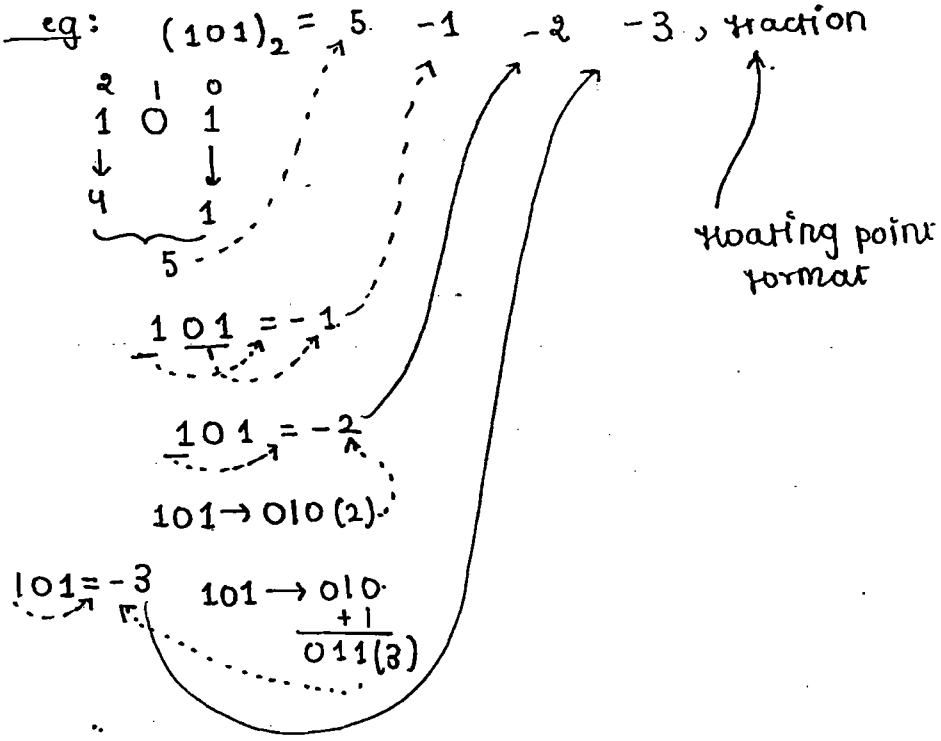
Decoding: In this process, n bit decoder produces 2^n output signals.



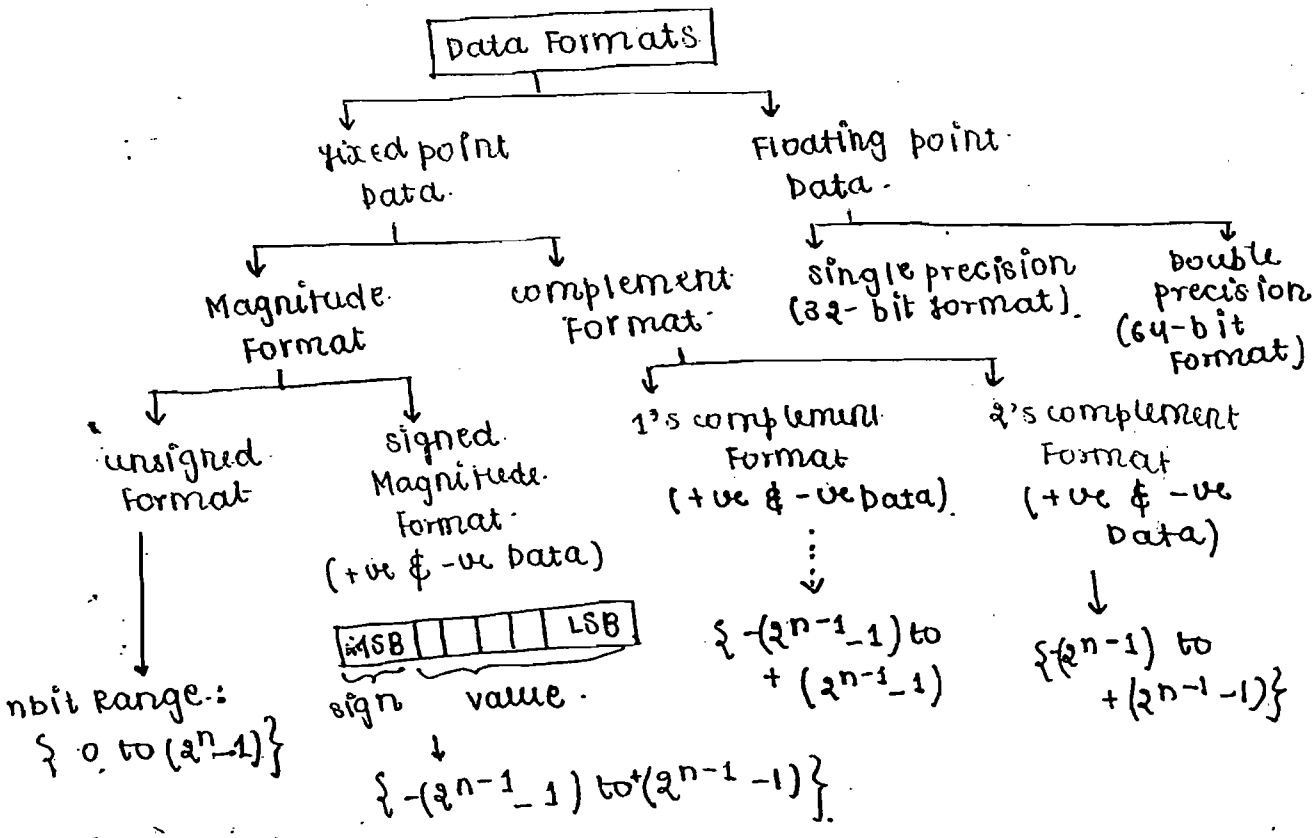
④ Data: It is a Binary code which is associated with a value based on the Data format.

Binary code - Bind with - value

eg: $(101)_2$ = 5 -1 -2 -3, fraction



Data Representation:



Operating Systems

Trapti Singh.

Teaching Schedule

I. Introduction and Background.

II. Process Management
- → process concept
- → CPU scheduling
- → Synchronization
- → Concurrent Programming.
- → Deadlocks
- → Threads.

III. Memory Management.
- → RAM Chip Implementation
- → Loading, Linking & Address Binding
- → Techniques
  - paging
  - Multilevel paging.
  - Inverted paging
  - Segmentation
  - Segmented Paging.
- → Virtual Memory.

IV. File Systems.

Textbooks

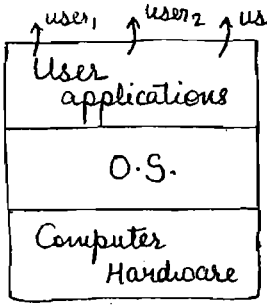
1. OS by Galvin.
2. Modern OS by A.S. Tenenbaum.
3. OS by William Stallings.

Chapter 1

Introduction and Background

Q. What is an OS?

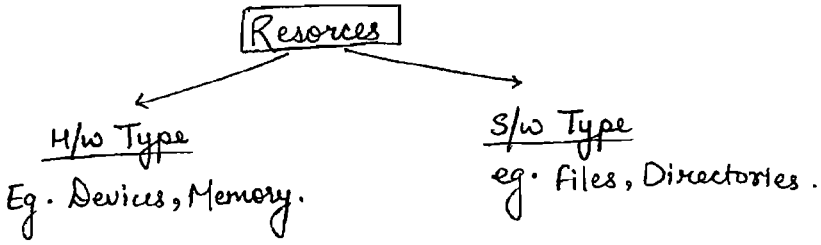
OS is an interface between user and computer hardware.




```
main()
{
  int x;
  printf("Hello");
}
```

→ internally calls write() System Call inorder to communicate with the monitor.

- System Call: System call is the request made by the user program to the OS in order to get any kind of service.
- Operating System is also called as Resorce Allocator because it is responsible for allocating resorces of a computer.



Goals of O.S.

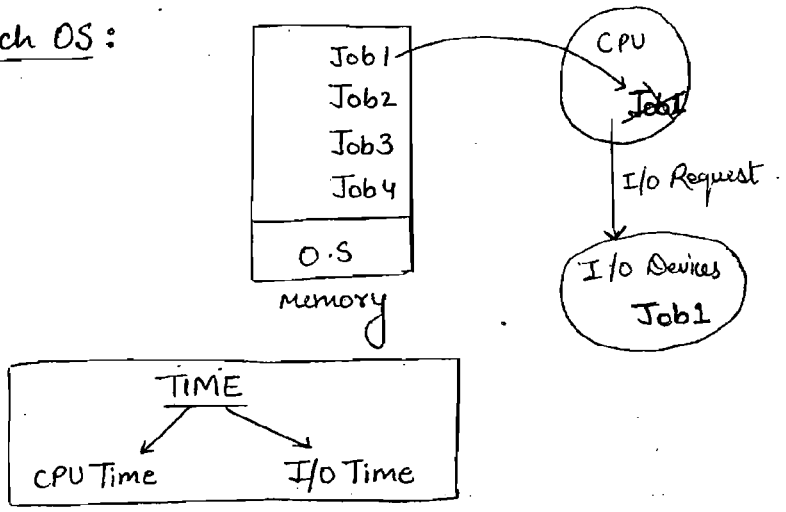
1. The primary goal is convenience. (easy to use)
2. The secondary goal is efficiency. (Stability).

~~Types of O.S~~

Q).

Types of OS

(1). The Batch OS:

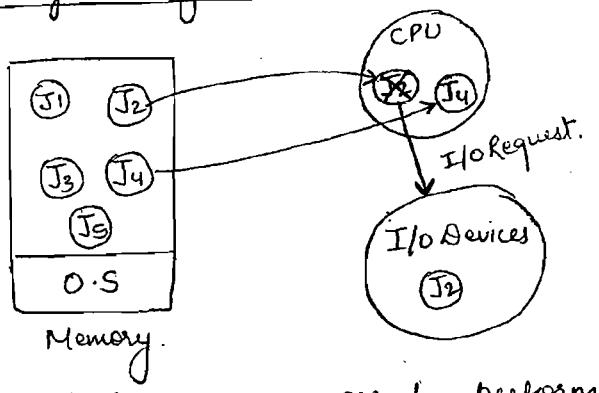


- If the Job is completed completely then only another Job will be scheduled onto CPU.
- Increased CPU idleness.
- Decreased throughput of the system.

Throughput: No. of jobs completed per unit time. is called throughput of the system.

Exp: IBM OS/2

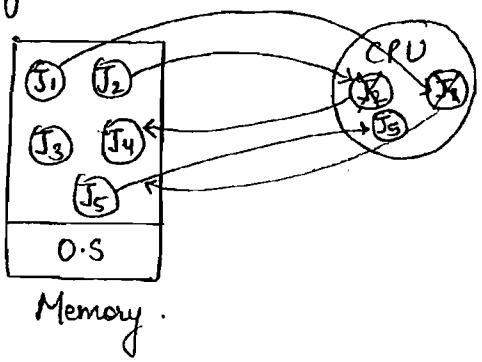
(2). Multiprogramming O.S:



- If the job is leaving the CPU to perform IO operation, then another job which is ready for execution will be scheduled onto CPU.
- **Advantage**
  - Increased CPU Utilization.
  - Increased throughput of the system.

Exp: Windows, UNIX.

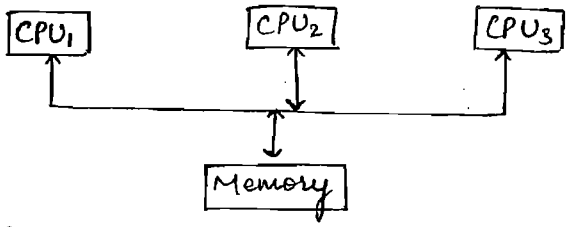
(3). Multitasking OS :



- Multitasking is an extension of multiprogramming OS.
- The jobs will be executed in the time sharing mode.

Exp: Windows, Unix

(4). Multiprocessor Systems :

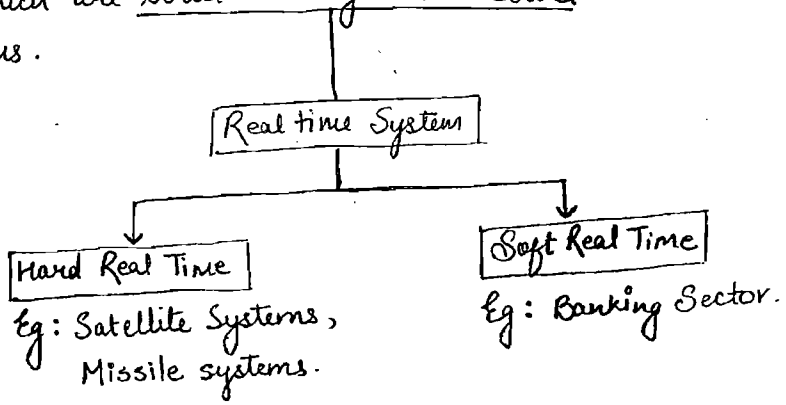


- Advantage
  - Increase the throughput of the system
  - Reliability
    - → Fault Tolerant Systems.
  - Economical.

Exp: UNIX.

(5). Real Time Systems :

- The systems which are strict deadly time bound are called as real time systems.



Exp: Sx works, Vx works, RTO's.

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Compiler Design

Topics List:

30 hrs. ≃ 12-15 days.

- Basics of a compiler
- Lexical Analysis
- Syntax Analysis
- Syntax Directed Translation
- Intermediate code generator
- Code Optimization
- Run time Environment

Text Book:

Compiler, Techniques & Tools

By Ullman

Marks: 4 to 9.

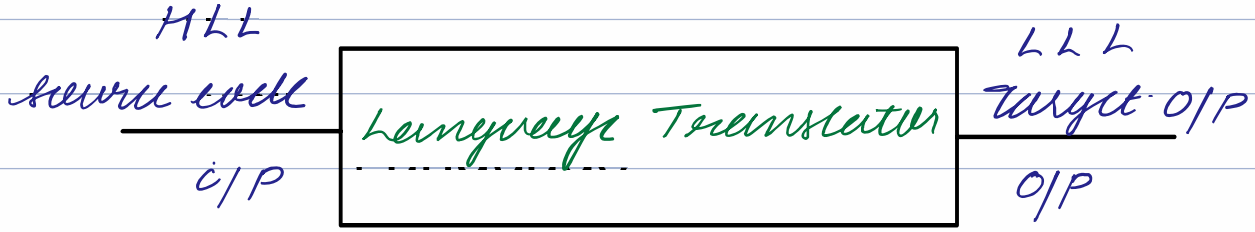
8500518598

prasad Sir (TOC & CD)

L#1 18/08/23

Basics of a compiler

Language Translator: A Language Translator takes one language as input and produces another language as output.



Types of Language translators

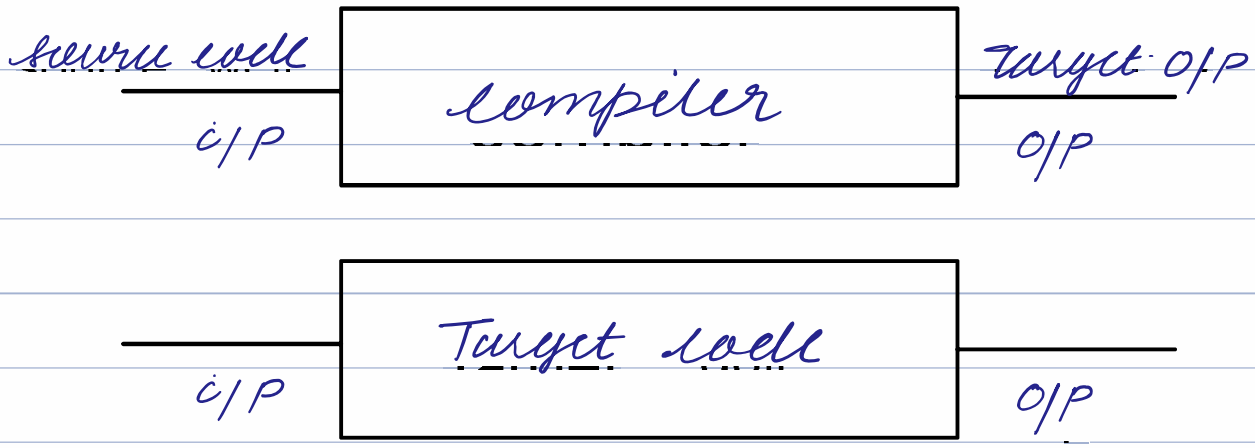
- compiler
- Assembler
- Interpreter

1. compiler: compiler takes the source code as input and produces the target code as output. If this target code is an executable code then it'll be called by the user to provide the inputs for producing the output.

compiler executes the entire code at a time from top to bottom. If any error

present at any line all of them will be given

Error Diagnosis in compiler is difficult compared to the interpreter but output generation by compiler is faster. compilation is an offline process.



Ex: Pascal, C, C++, C#

2. Interpreter: Interpreter takes the source code as input and produces the direct output. It will not produce any intermediate language as in the case of compiler.

Interpreter executes the source code line by line, if any error present at any line immediately that error will be produced. Until the programmer resolves that error the interpreter will not execute the next line.

Error Diagnosis is easy in the case of Interpreter. The Interpreter executes the each statement and it process the inputs simultaneously. Thus, interpreter is Online process.
As interpreter produces the output directly we need not to store the executable code anywhere in the main memory.

Thus, Interpreter takes less memory compared to the compiler. The end user can easily modify the source program in the case of interpreter.

Ex: Python, LISP, PERL, RUBY

3. Assembler: Assembler takes Assembly language code as input and produces relocatable machine code as output which is ready for execution.

Assembly language uses opcode for the instructions. An opcode mnemonically gives the information about the particular instruction. The symbolic representation of the opcode is called as Mnemonics.

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ENGLISH

1] Correction Of Sentences

2] Vocabullary

3] Critical Reasoning

4] Analogy.

01. CORRECTION OF SENTENCES

Subcontents

1. Question Tags
2. Usage of
   a) As soon as
   b) No-Sooner - Than
   c) Hardly - When
   d) Scarcely - When / Before
3. Degree of comparison
4. Articles
5. Tenses + If clauses
6. Reported speech
7. Prepositions
8. Parts of speech
9. Concords and Corrections

- Sentences: 4 kinds

1. Assertive
   a) Positive
   b) Negative.
2. Interrogative
3. Imperative
4. Exclamatory.

Special Verbs: (24)

am, is, are, was, were, have, has, had, do, does, did, will, would, shall, should, can, could, may, might, must, need, dare, used to, ought to.

Negative :-

To make a negative sentence, put NOT after the special verb.

Interrogative :-

To make an Interrogative sentence, put the special verb at the starting of the sentence.

Ex:- Dhoni is a perfect Gentleman (positive)

Dhoni is not a perfect Gentleman (Negative)

Is Dhoni a perfect Gentleman ? (Interrorgative)

* Non-Special Verbs :

borrow :- do/does/did

do = present Sentence without 's'

does = present Sentence with 's'

did = Past tense

Note: When we borrow do, does, did, put the root verb in negative and interrogation.

Ex:-
He goes to Temple (positive)
He does not go to Temple (Negative)
Does he go to temple ? (Interrogative)

Ex:- He went to Temple (+ve)
He did not go to Temple (-ve)
Did he go to Temple ? (Interrogative)

- Do, Does, Did
These 3- always take root verb.

01. QUESTION TAGS

After giving a statement, we sometimes confirm IF the Listener is accepting (or) Not with our statement. This confirmation is called Question Tag.

Note: Question Tags are of mainly 2 kinds-

Model 1:
To a positive statement, Negative tag is added.

Rules: 1) only short forms are used
2) In the place of nouns, use pronouns.

Note: Question Tag should be ended with ~~special verb~~ Pronouns.

Ex:- Dhoni is a perfect Gentleman, isn't he?

Ex:- The clock is running past, isn't it?

Ex:- I am a teacher of English, aren't I?

Ex:- We are the ilk (family) of Made Easy, aren't we?

Ex:- My neighbour comes tommorow, doesn't he?

Ex:- All the students went to picnic, didn't they?

Model 2:

If the statement is negative, the Question Tag is positive.

x:→ am not a teacher of English, am I?

:→ My friend doesnot known address, Does He?

or model②

Formula: Special Verb + Pronoun

02. USAGE OF

Hardly, rarely, seldom, scarcely, barely, never

Note: These words always give negative sense. In the case of these words the Question Tag is positive.

eg:→ He hardly comes to my house, does he?

eg:→ Barking dogs seldom bite, do they?

eg:→ They never came to my House, did they?

Usage of Have, has, had—

Note: These three act as two kinds.

1. Mainverb - (gives the meaning of possessing)
2. Special-verb - (does not give any meaning)

eg:→ He has (mainverb) a car, doesn't he?

eg:→ He has purchased (Special verb) a car, hasn't he?

He had solved the problem before I went, hadn't he?

He had a problem calling, didn't he?

Usage of Everyone, Everbody, Someone, Somebody, Noone, Nobody

Note: These six words take singular verb at the time of statements but in question Tags these words take plural verb.

☞ In the place of all these words we have to write 'they'

Singular Verbs		plural verbs
Is	⟶	are
was	⟶	were
has	⟶	have
does	⟶	do

eg:→ Everyone is coming, ~~isn't everyone~~ ? aren't they?

eg:→ Everyone Likes Music, don't they?

eg:→ Everyone has given mobile, haven't they?

eg:→ Everyone has mobile, don't they?

eg:→ None is coming, are they?

eg:→ No one supports corruption, do they?

- Usage of a few = positive | a little = positive
  few = Negative | little = Negative.

eg. He asked me a few books (+ve), didn't he (-ve)?

He asked me few books (-ve), did he (+ve)?

He wants a little, ~~don't~~ doesn't he?

He wants little, does he?

• Usage of making Imperatives in as Question Tags.

Imperative:-

Rules:

① Subject you in absent (But the meaning is implied in it)

② Sentence begin with V_1

③ Expresses command (or) request.

Note: Imperatives generally take "will you?" in Question Tags.

A sentence i.e. satisfied with these three rules is called Imperative

eg: ① Come here, will you?

② Go there, will you?

③ Don't come here, will you?

④ Shup up, Can't you?

⑤ Get Lost, Can't you?

⑥ Keep Silence, Can't you?

• If the Statement begins with Let's or Letus
∴ The question Tag is always shall we?

eg: 1) Let's start the work, shall we?

2) Let's not start the work, Shall we?

3) Let him go, will you?
Not Let's or Letus.

• If the statement begins with 'So'

a) To a positive statement, Question Tag is also +ve

b) To a negative statement, Question Tag is also -ve.

eg: So you are coming, are you?

So you are not coming, aren't you?

No → Numerical oiter

i.e → i-deste → Frenchword

silent → silence (singular → plural)

- Usage of
  a) as soon as
  b) No-sooner-than
  c) Hardly-When
  d) Scarcely - when/Before

Note: These four words are called 'Idiomatic Expressions'

These four words give the same meaning. i.e. Immediately.

Note:

Usage of No-sooner-than

~~More sooner-than~~

Rules: ① put No-sooner in the place of as soon as

② change the as soon as sentence into interrogative form.

③ put than before the second sentence.

eg: 1) As soon as I went home, I had rest.

→ No sooner did I go home than I had rest.

2) As soon as the baby sees the doctor, she will cry

→ No sooner does the baby see the doctor than she will cry.

- Usage of Hardly when:

Rules: ① put Hardly in the place of as soon as

② Change the as soon as sentence had + V3 form and then Change into interrogative form,

③ put when before the second sentence

eg: 1) As soon as I went home, I had rest.

→ Hardly had I gone home when I had rest.

Usage of Scarcely when / before

Note: The same rules of hardly when are applicable

eg: 1) As soon as the principal entered the classroom, all the students stood up.

→ Scarcely had the principal entered the classroom when / before all the students stood up.

2) As soon as he had explained the topic, students felt happy.

→ No sooner had he explained the topic than students felt happy.

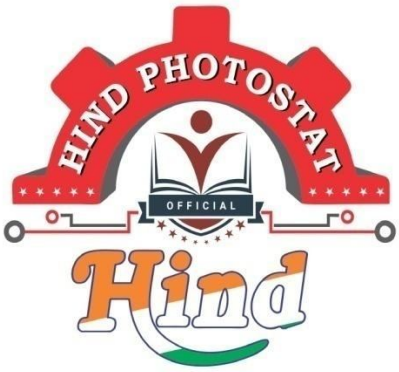
→ Scarcely had he explained the topic when / before students felt happy.

→ Hardly had he explained the topic when students felt happy.

03. DEGREES OF COMPARISON

Three forms of the adjective and adverbs are called degrees of comparison.

1. positive degree
   a) ~~as soon as~~ as-as (accepting sense)
   b] so-as [Negative sense].
2. Comparative degree [Takes than]
3. Superlative degree [Takes the]



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D , E /E / **4.** / E /E /
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Reasoning + Aptitude

Gate = 10 - 13 Marks
ESE = 22 means 10 %

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chapt 1. Number System.

Factors :-

Factors are the set of ~~set~~ numbers which will divide a given number completly.

$$N = a^p \times b^q \times c^r$$

$$Tf = (p+1)(q+1)(r+1)$$

Where, a, b, c are distinct Prime Numbers
p, q, r are natural Numbers.

① $N = 72 = 2^3 \times 3^2 = 4 \times 3 = 12f$

1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72.

② $N = 120 = 2 \times 3 \times 5 = 4 \times 2 \times 2 = 16f$

1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120

$N = 9000 = 2^3 \times 5^2 \times 5^3$

TF = ~~4x~~ $(p+1)(q+1)(r+1) = 4 \times 3 \times 4 = 48$

Odd factor = 2 को छोड़ो और बाकी वालो का T.F निकालो.

$(q+1)(r+1) = 3 \times 4 = 12$ — odd factor.

Even factor = $48 - 12 = 36$ factors.

≠ Prime and Composite factors.

Prime has only two factors.

e.g. = 7 = 7, 1

5 = 5, 1

* Composite has more than two factors.

e.g. = 4 = 1, 2, 4

6 = 1, 2, 3, 6

* Prime & compo. factors.

e.g. $9000 = 2^{(3)} \times 3^{(2)} \times 5^{(3)}$

= Total factors = 48

= Don't go for higher power of No. सभी को छोड़ दो.

= Prime factors are = 2, 3, 5 (3)

= Neither Prime Nor composite = 1 (1)

= Composite factors = T.f − (P.F + N.P.N.C)

= 48 − (3 + 1)

composite factors = (44)

e.g. $72 = 2^{(3)} \times 3^{(2)}$

Total factors $= 4 \times 3 = \underline{12} = Tf + cf + 1$

Prime factors $= 2, 3 = \underline{(2)}$

For prime remove higher power of factors

NOR composite NOR prime $= 1 = (1)$

composite factors = Total factors $-$ (P.F + N.P.N.C)

$= 12 - (2+1)$

$= \underline{(9)}$

* Formula :-

Total factor = Prime factor + Compo. factor + 1

NOT IMPORTANT

$N = a^p \times b^q \times \ldots\ldots$

$$\text{Sum of all factors} = \frac{(a^{p+1}-1)}{(a-1)} \times \frac{(b^{q+1}-1)}{(b-1)}$$

E.g. $N = 72 = 2^3 \times 3^2$

$$\text{Sum of all factors} = \frac{(2^{3+1}-1)}{(2-1)} \times \frac{(3^{2+1}-1)}{(3-1)}$$

$$= \frac{15}{1} \times \frac{26}{2}$$

$$= 15 \times 13$$

Sum of all factors = 195

$N = a^p \times b^q \ldots\ldots\ldots$

NOT IMPORTANT for Gate.

Product of all factors $\longrightarrow (N)^{\frac{Tf}{2}}$

$= (N)^{\frac{Tf}{2}}$

e.g. = 72

$N = 72 = 2^3 \times 3^2$

$Tf = 4 \times 3 = 12.$

Product of all factors $= (72)^{\frac{12}{2}}$

$= (72)^6$

e.g = 36

$= 2^3 \times 3^2$

$= 3 \times 3$

$Tf = 9.$

Product of all factors $= (N)^{\frac{Tf}{2}}$

$= (36)^{9/2}$

$= (36)^{4.5}.$

Base System

$(25)_{10} \equiv (\overset{2^4}{1}, \overset{2^3}{1}\ \overset{2^2}{0}\ \overset{2^1}{0}\ \overset{2^0}{1})$

2	25	Reminder
2	12	1
2	6	0
2	3	0
	2	1
	1	

$= 16 + 8 + 1$

$= 25.$

Q. If $137 + 276 = 435$ how much $731 + 672$?

(a) 534 (b) 1403 (c) 1623 (d) 3162.

$\Rightarrow$
$$\begin{array}{r} 1\ 3\ 7 \\ +\ 2\ 7\ 6 \\ \hline 4\ 3\ 5 \end{array}$$
Here base = 8

$$\begin{array}{r} 7\ 3\ 1 \\ +\ 6\ 7\ 2 \\ \hline 1\ 6\ 2\ 3 \end{array}$$ $b = 8$

Q. = IF $137 + 276 = 435$ how much $731 + 672$?

$$\begin{array}{r} 1\ 3\ 7 \\ +\ 2\ 7\ 6 \\ \hline 4\ 3\ 5 \end{array}$$ base = 8

8 8

$$\begin{array}{r} \not{7}\ 6\ \ \not{3}_2\ 1 \\ (-)\ 6\ \ 7\ \ 2 \\ \hline 0\ \ 3\ \ 7 \end{array}$$

Q.

7 7 7

$$\begin{array}{r} 2_1\ \ \not{3}_2\ \ 4_3\ 2 \\ (-)\ \ 1\ \ 6\ \ 5\ \ 6 \\ \hline 0\ \ 3\ \ 5\ \ 3 \end{array}$$

$$\begin{array}{r} 2\ \ 2\ \ 4\ 6 \\ (+)\ \ 4\ \ 4\ \ 2\ 2 \\ \hline 1\ 0\ 0\ 0\ 1 \end{array}$$

$6 + 2 = b + 1$ = base = 7

Q. Consider the equation $(7526)_8 - (Y)_8 = (4364)_8$, where $(X)_N$ stands for X to the base N. Find Y.

(a) 1634 (b) 1737 (c) 3142 (d) 3162.

~~75226~~

$a - Y = b$

$Y = (a - b)$.

$$\begin{array}{r} 7\,5\,4\,2\,6 \\ -\quad 4\,3\,6\,4 \\ \hline 3\,1\,4\,2 \end{array}$$

base = 8

ANS ✓

Cyclicity :-

4 Cycle →

N	Reminder	formula	NO.	NO.	NO.
2	1	4n+1	3	7	8
4	2 Rem	4n+2	9	9	4
8	3 R	4n+3	7	3	2
6	4	4n+4	1	1	6

e.g. $(732)^{2\left(\frac{27}{4}\right)}$ reminder = 3 = u = ?

u = 8

e.g = $(453)^{2\left(\frac{22}{4}\right)}$ reminder = 2 = u = ?

u = 9

2. Cyclic →

★ N N

odd 4 odd 9 → $(79)^{9\,1 = \text{odd}}$ = Ans = 9

even 6 even 1 → $(79)^{9\,2 = \text{even}}$ = Ans = 1

No. that NOT follows Cyclicity

[0, 1, 5, 6]

Q. The numeral in the units position of $211^{870} + 146^{127} * 3424$ is

↳ $211^{870} + 146^{127} * 3^{\frac{424}{4}}$ remainder = 1.

$= 1 + 6 \times 1$

Ans = 7

Q. The last digit of $(2171)^7 + (2172)^{\frac{9}{4}} + (2173)^{\frac{11}{4}} + (2174)^{\frac{13}{4}}$ is

$1 + 2 + 7 + 4$

↳ **Ans = 4**

Factorial

It is product of natural Numbers.

$4! = 1 \times 2 \times 3 \times 4$

$5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$

$6! = 6 \times 5! = 720$

$7! = 7 \times 5! = 5040$

$P = 1! + 2! + 3! + 4! + 5! \cdots\cdots 99!$ = ?

$1 + 2 + 6 + 24 + 0 + 0 + 0 \cdots + 0$

$= 33 + 0 + 0 + 0$

So unit place is 3.

$100! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \cdots\cdots \times 100$

$\frac{100}{5} = 20$ $[5, 10, 15, 25 \ldots 100] \Rightarrow 5^1$

$\frac{20}{5} = 4$ $[25, 50, 75, 100] \Rightarrow 5^2$

24