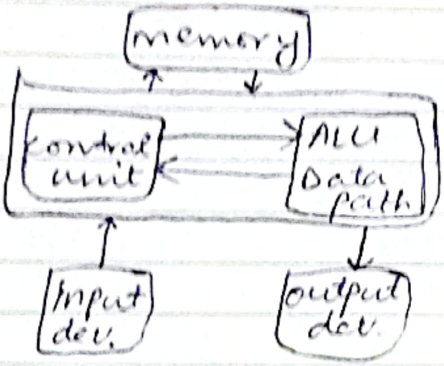
DLD - lec 1 — 14 Feb 21

Ch 1, 2, 3, 4

logic and computer design fundamentals. (5th ed)

Assignments from 4th ed.

Block diagram of digital computer.



- Arrows show flow of data.
- Diff. comp. of comp. system are shown in diagram.
- Memory save data and program.
- ☆ which are diff. input dev. ?
- ☆ " " " output dev. ?

Data Path : Arithmetic and logic operations

Control unit : co controls everything e.g. • flow of prog. • Runing the sys. • Runing programs fetching code line one by one.

Sample Prog:

```
integer a,b,c;
input a ;
input b ;
c = a + b ;
print c;
```

If you are a control unit

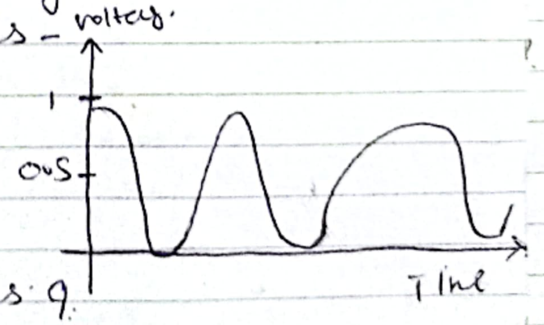
- How control unit runing the sample prog.
- data is traveling from one to other component.
- data coming from keyboard.
- Addition in data path.
- Storing in memory.
- display on screen LCD.

How is data traveling ?

Data travels in form of signals - voltage.

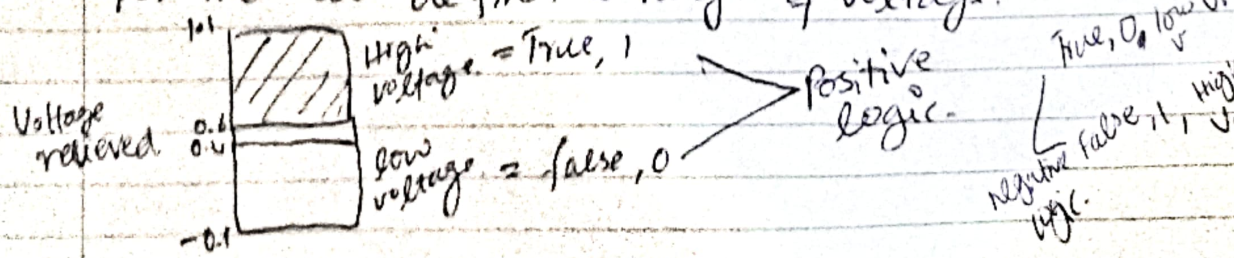
device 1 $\xrightarrow{\text{signal, electrical voltage}}$ device 2

Keyboard $\xrightarrow{\text{signal}}$ CPU

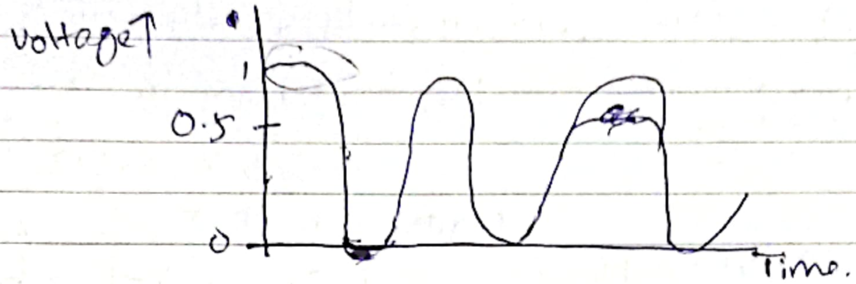


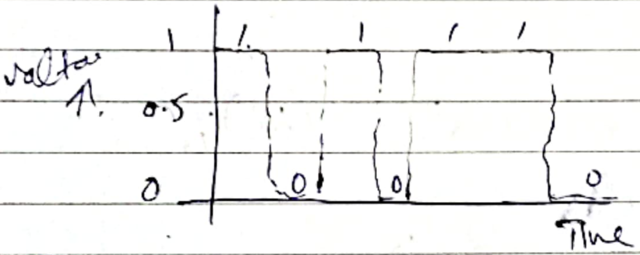
How will we save this signal as 9.

For this we define a range of voltage.



Now voltage has been converted into 0/1 binary numbers-





1010110

If dotted line indicates start of a binary number which binary no. have we recieved in above signal.

Answer ?: 1010110

This is how data is recieved into/from a devic.
This 0/1 is called binary digit or bit.

Binary to decimal conv.

(Number) Base

$(11010)_2 = (?)_{10}$

$1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0$

$16 + 8 + 0 + 2 + 0 = (26)_{10}$

$(0.6875)_{10} = (1011)_2$

$(625.6875)_{10} = (1001110001.1011)_2$

$(11010.11)_2 = (?)_{10}$

$1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0 + 1\times2^{-1} + 1\times2^{-2}$

$26 + 0.5 + 0.25$

$(11010.11)_2 = (26.75)_{10}$

2	625	
2	312	1
2	156	0
2	78	0
2	39	0
2	19	1
2	9	1
2	4	1
	2	0
	1	0

$(625)_{10} = (1001110001)$

(625.6875)
integer — fraction

• keep mult. until we get 000 in fraction part.

keep

$0.6875 \times 2 = 1.3750 \times 2$ → 1

$1.5000 = \times 2$ 0.7500 → 0

→ 1

$1.000 = 2 \times 0.5000$ → 1

0 in fraction part.

4 types of number system.

① $(\text{Decimal})_{10}$ ② $(\text{Binary})_2$ 3 $(\text{Octal})_8$ 4. $(\text{Hexadecimal})_{16}$.

✓.

$(724.542)_{10} = 7\times10^2 + 2\times10^1 + 4\times10^0 + 5\times10^{-1} + 4\times10^{-2} + 2\times10^{-3}$.

most significant digit

least significant digit

Digits in base 10 are

0, 1, 2 ... 8, 9.

Digits in base r.

0, 1, 2, ..., $r-1$

~~(r) 5 b~~

(r) is base or radix

10	A
11	B
12	C
13	D
14	E
15	F

→ we use A, B, C. after 9

$(15)_{16}$ $1\times16^1 + 5\times16^0 = (21)_{10}$.

$(F)_{16}$ $15\times16^0 = (15)_{10}$

(7 8 4.5) is not in base-8. bcz of 8

you

1010

4.0

OOPS

14 Feb

Big Endian
Little Endian
Middle Endian
Hamen bas bas

① pointers have data type → integers.
② This is type of variable which is pointed.
~~char *~~ p.

— char a = 'A'

0x2A [A] a

— ~~char *~~ char * p = &a;

0x2E [0x2A] p

passing array as a function.

— cout << a; // A.
— cout << p; // 0x2A
— cout << *p; // A.

① identifier.

Same type

→ Pointing a pointer copies.

— char * q = p.

0x3F [0x2A] q.

Now q is pointing towards a.

— cout << *q; // A.
— cout << q; // 0x2A

0x4A [~~3~~] b

char ~~*~~ b = ~~0~~'C';
p = &b;

[0x4A] p

int * r = 0; → good idea to initialize to 0.
cout << r // 0.
→ its a null pointer.

Thomas Cal- → Ch 10

index

Sequence: $a_1, a_2, a_3, \ldots, a_n, a_{n+1}, \ldots$

terms

→ order is important.

→ There is integer corresponding to each term.

$1 \longrightarrow a_1 = 3$
$2 \longrightarrow a_2 = 6$
$n \longrightarrow a_n = 3n$

→ An infinite seq. is a fn. whose domain is set of integers.

$f(n) = a_n$

other notations:

$\{a_n\}$ or $\{a_1, a_2, a_3, \ldots, a_n, \ldots\}$ or $\{a_n\}_{n=1}^{\infty}$

Ex 10.1 Q15

$1, -4, 9, -16, 25, \ldots$

$a_n = (-1)^{n+1} n^2$

Q18 $-\frac{3}{2}, -\frac{1}{6}, \frac{1}{12}, \frac{3}{20}, \frac{5}{20}$

$+\frac{2}{4+n}$ $n=0$ $+\frac{2}{4+2(n)}$ $n=0$

$a_n = a_1 + (n-1)d$

$+(1)^n$ $= -3 + (n-1)2$ $n(n+1)$ $n=0$

$= -3 + 2n - 2$

1 $= 2n - 5$

Q25 $1, 0, 1, 0, 1, \ldots$

$(-1)^{n+1} + 1$

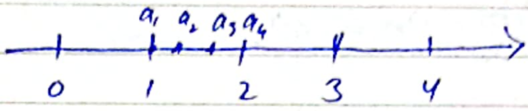
2

Q24, $\dfrac{(n)^3}{(5)^{n+1}}$

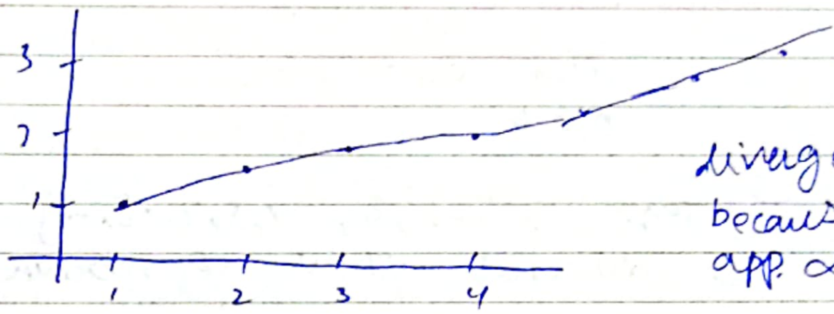
Graphical represent.

$a_n = \sqrt{n} = \{1, \sqrt{2}, \sqrt{3}, \sqrt{4}, \dots$

Real axis



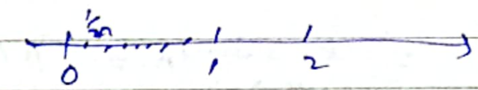
As a fn.

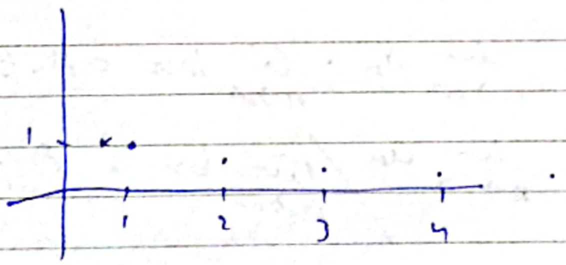


divergent because app. ∞.

$a_n = 1/n$

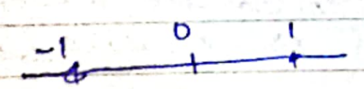
Real axis $= \{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots\}$

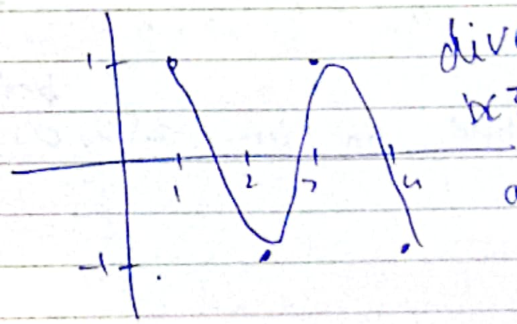




convergent. because ~~app. 0~~ app. 0.

$a_n = (-1)^{n+1}$





divergent bcz doesnot app single pt.

Convergent & divergent seq.

- If $\{a_n\}$ converges to 'L'

$$\lim_{n\to\infty} a_n = L.$$

- If no such L exist, seq. is divergent.
- The seq. diverges to infinity if.

$$\lim_{n\to\infty} a_n = \infty.$$

- Similary ∞, a_n diverges to -ve infinity if.

$$\lim_{n\to\infty} a_n = -\infty.$$

- The seq. $\{1,-2,3,-4,5,7,-8,\dots\}$ $\{1,0,2,0,3,0,\dots\}$ are divergent without approaching. boundary ∞ or $-\infty$.

- If $\{a_n\}$, $\{b_n\}$ are sequences s.t. $\lim_{x\to\infty} a_n = A$, $\lim_{n\to\infty} b_n = B$.

1. $\lim_{n\to\infty} (a_n \pm b_n) = \lim_{n\to\infty} a_n \pm \lim_{n\to\infty} b_n = A \pm B.$

2. $\lim_{n\to\infty} (k \cdot a_n) = k \lim_{n\to\infty} a_n = kA.$

3. $\lim_{n\to\infty} (a_n \times b_n) = \lim_{n\to\infty} a_n \times \lim_{n\to\infty} b_n = A \cdot B.$

$$\lim_{n\to\infty} (a_n/b_n) = \lim_{n\to\infty} a_n \Big/ \lim_{n\to\infty} b_n = A/B.$$

$a_n = \{1,2,3,\dots\}$ $\quad b_n = \{-1,-2,-3,\dots\}$.

both a_n, b_n are divergent.

but $a_n + b_n = \{0,0,0\}$ is convergent on 0.

reflected Photo copier

care pern-ounciation

If

If a_n = conv. , b_n = conv. then, $(a_n \pm b_n)$ = conv.
If $(a_n \pm b_n)$ = conv. then may or may not a_n = conv. b_n = conv.

If a_n = div , b_n = div. the $(a_n \pm b_n)$ = may or may not conv. or dive.

Eng

Foundations of comunication

following

look down upon your cultural situation

→ Com. Content. The phy. social, cult, histrol, psychologi- situations that surrounds comunication event

→ Phy. sit → str – location, enviroment
social situati. → nature of relationship b/w participant.

(Prep. Practice. Perfor.) 3P.

Com. Proc. Pg 11 context, participants, chanels message, interference.

Maria and danien are meandering through the park - taking and drinking bottled water. Danien finishes his bottle, replace the lid and toses the bottle into the bushes at the side of the path. Maria who has been listening to danien talk, comes to a stop, puts her hands on her hip stares at danien and says angrily "I cant believe what you just did"

1) Content (a) physical (b) social (c) historical (d) psyco

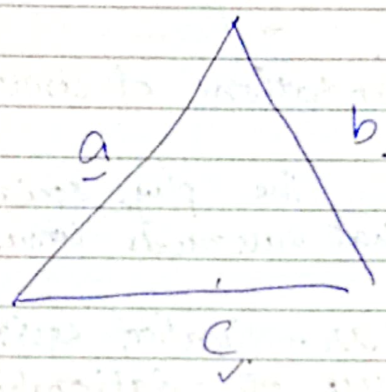
2) Participant

3) Message 272-

4) Chanel.

5) Feedback

6) Interference



(a==c && a!=b). ||

(a==b && a!=c.) ||

(b==c b!=a)

Interesting.

DLD - lec2 - 16 Feb

Data ranges : Let 1 bit represent 1 box $\boxed{\ }$

- minimum value of it can have. $\boxed{0}$

maximum " " " " $\boxed{1}$

Range $0 \to 1$

→ 2 bits $\boxed{\ }\boxed{\ }$

min. value. $\boxed{0}\boxed{0}$, max value $\boxed{1}\boxed{1}$

all posible values 00, 01, 10, 11

0 1 2 3

Range $0 \to 3$.

→ Let n be no. of bits.

Range : $0 \to 2^n - 1$.

→ Range of fraction.

Range: $0 - \dfrac{2^n - 1}{2^n}$

Conventions : we say kilo = 10^3, 4kg = 4000g.

But in dealing with data.

2^{10} = K (Kilo). 1kb = 1024 byte.

2^{20} = Mega (M), 16M = 16×2^{20} bytes.

2^{30} = Giga (G).

2^{40} = Tera (T).

Arithmetic operations.

addition

b10 →

$$\begin{array}{r} 1\ 1\ \ \\ 705 \\ 495 \\ \hline 1260 \end{array} \quad >10. \qquad 10 \overline{)10} \ \ 1 - 0 \qquad 10 \overline{)16} \ \ 1 - 6$$

If ans >= base then → factrize.

b2 →

$$\begin{array}{r} 011001 \\ 001001 \\ \hline 100010 \end{array} \quad >2. \qquad 2 \overline{)2} \ \ 1 - 0$$

✓

10
11
12
13
14
15

b16 →

9CA17F
325E81
CF000 0.

1$\cancel{7}$ 16

16|16
1-0.

59F
+ E46
~~12E5~~
13E5

21

16|21
1-5.

16|19
1-3

$\boxed{\text{basics}}$

subtraction.

754
-469.
285.

10110
-10010
00100

1=2.

2

10110100
-11001101
1

?

10011 → 19.
11110 → 30

as ~~10011 < 11001~~
so 10011 < 11110.
10+0 ~~11001~~

11110
10011

51000 0
7998

1000010
0.01101
0.00101

Binary mul.

$$\begin{array}{r} 1011 \\ 101 \end{array}$$

$$\begin{array}{r} 762 \\ \times\ 45 \\ \hline 14672 \\ 3710\times \\ 43772 \end{array}$$

$\frac{110}{1 \cdot 2}$ 31

?

H.W.

$(673.12)_8 = (?)_2$

$(3A6.C)_{16} = (?)_2$

$(E59C.04B)_{16} = (?)_8$

Binary → octal / Hexade.

$(10\ 1100\ 0110\ 1011\ 1111\ 0000\ 011)_2$

$b_2 \to b_n$

for base $= 2^n$ we need min. n bits to represent any digit of that base.

Base $8 = 2^3$ Method is valid for 2^n only.

octal	0	1	2	3	4	5	6	7
binary	0	01	10	11	100	101	110	111
	000	001	010	011	100	101	110	111

consider $(789.526)_{10}$

If had to add 0 →

left in 789

right in .526

$\boxed{\begin{array}{l} 00789 ✓ \\ .52600 ✓ \end{array}}$ $\boxed{\begin{array}{l} 78900 \times \\ .00526 \times \end{array}}$

for base 8 → make grp of 3 as $2^3 = 8$.

similarly for b16 grp of 4.

$(26153.7406)_8$

10 110 001 101 011 . 111 100 000 110

010 110 001 101 011 . 111 100 000 110

$(2\ 6\ 1\ 5\ 3\ .\ 7\ 4\ 0\ 6)_8$

idea to expand — Practice of that idea of exp — super power

Imperialism — Colonilism

old — new

$\boxed{\text{soft}}$

FATF ROGUE EVIL

FATF ROGUE EVIL

1648 — 1857

old 1720. — 1947

SCS South china sea

BLACK 1453

1963

BRI $\boxed{\text{Last}}$ $\boxed{\text{Last}}$ 19

spartley

Russian

Japain

China

Conflicts Area.

Wars $\boxed{\text{Last}}$

Japan FATF $\boxed{\text{last}}$

Russia

Regional

Ice Miles

Geographical

old methods.

Finance Minister.

Weapons.

Cut

Unemployment.

Govt. Tabah Do.

Argentic.

Dr Thumb ul-Pra[illegible]

21-Feb Political & civil explor[illegible] British industrialization

Political + Economical

1)- Democracy

2)- English

3)- Education

4)- Rule of law

4)- Railway

british said they gave indians that Rule

British took over bengal ← [illegible] ← 1757

1857	1947	1857	1947
27%	2%	23%	4%
world trade share		G.D.P	

only 1/250 got voting right in 1919

taxes in mughal 44% in british 66%

self entities

under british india became importer from exporter.

Educ

WWI

GI GII

In world war 1/6 was indians in british side.

Germany

1600 — 1947

1.8% 10%

why they made rails

→) transport raw material (out source)

1600	1947
1.8%	10%
G.D.P	
british	

→)

16 27. 90%

it was 4 bytes. so one add/subtract will move 4 bytes.

we

*P

OOPs.

0x 20

$(24)_{16}$ $(\ )_{10}$

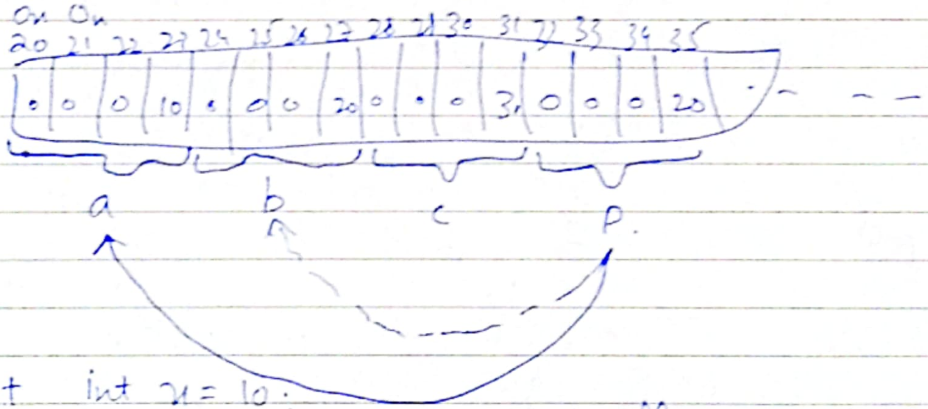
$2 \times 16^1 + 4 \times 16^0$

$32 + 4$.

36.

```
int a=10, b=20, c=30;
int *p = &a;
*p = *p+1;   ---> ordinary arithmetic.
cout << *p; // 11 ,   cout << p // 0x20.
p = p+1;
cout << p; // 0x 24.
cout << *p; // 20.
```

int has 4 bytes. so one add/subtra will move 4 bytes.




```
const int x = 10;
const int *p = &a;   as a is const then p must be const.
*p = 11;   error
```

p = p+1; => will change address and logical error no syntax or compilation error.
to avoid this

we use this. int a = 10.

```
int * const p = &a;
p = p + 1;   Now will give error at
```

const int a = 10;

const int * const p = &a;

This constt will prevent change of value of a or *p.

This constt will prevent changing of address or p.

→ array is constt pointer to a non-constt value.

~~for( )~~

```
int ar[3] = {10, 20, 30};
~~int * ptr = ar;~~
for (int i = 0; i<3, i++){
{   ar ++;  → error
    ~~cout <<~~
}
int * ptr = ar;
~~for(int i=0;~~ i< 3, ++i)
{   cout << *ptr;
    ptr++;  ↑ will work
```

Or 20 }

(ptr + i)

1st 1

2nd 2

3 ✓

int a=10, b=20;

int &r = a;

cout << a // 10 +! ✓

a = b; ~~*p~~;

cout << r. cout << a; //20

20
21
22
3.

```
int a=10, b=20;
int &r=a;
cout<<a; // 10
cout<<r; // 10
a=b;
cout<<a; // 20
cout<<r; //
```

Cal - II lect 2 17 - Feb.

- Sandwhich Th. for seq.

If $a_n \le b_n \le c_n$

$\lim_{n\to\infty} a_n = \lim_{n\to\infty} c_n = L$. $\left[\cancel{\lim_{n\to\infty} b_n}\right]$

$\Rightarrow$ then. $\lim_{n\to\infty} b_n = L$.

Example. ① $a_n = \frac{\cos n}{n}$.

$-1 \le \cos n \le 1$

$\Rightarrow -\frac{1}{n} \le \frac{\cos n}{n} \le \frac{1}{n}$.

As $\lim_{n\to\infty} \frac{1}{n} = 0$.

$\Rightarrow 0 \le \lim_{n\to\infty} \frac{\cos n}{n} \le 0$.

$\Rightarrow \lim_{n\to\infty} \frac{\cos n}{n} = 0$

② $a_n \frac{(-1)^n}{n}$ $-1, \frac{1}{2}, \frac{-1}{3}, \frac{1}{4}, \frac{-1}{5}$.

$-\frac{1}{n} \le \frac{(-1)^n}{n} \le \frac{1}{n}$.

as $\frac{1}{n} \to 0$, as $n \to \infty$.

$\Rightarrow \frac{(-1)^n}{n} \to 0$

$-\frac{1}{2} \le \frac{1}{2} \le \frac{1}{2}$.

$-\frac{1}{3} \le -\frac{1}{3} \le \frac{1}{3}$.

Cont. fn. th.

If $a_n \to l$
and f is cont.
$\to f(a_n) \to f(L)$

$1+\frac{1}{n} \to 1$ as $n\to\infty$

$\sqrt{1+\frac{1}{n}} \to 1$ as $n \to \infty$

$e^{1/n} \to e^0$ as $n \to \infty$ as $\frac{1}{n}\to 0$.

Q41

$$a_n = \sqrt{\frac{2n}{n+1}}$$

$$\lim_{n\to\infty} a_n = \lim_{n\to\infty}\sqrt{\frac{2n}{n+1}} = \sqrt{\lim_{n\to\infty}\frac{2n}{n+1}}$$

$$= \sqrt{\lim \frac{2}{1+1/n}}$$

Q42 $\quad a_n = \frac{1}{(0.9)^n}$

$$\lim_{a_n\to\infty} a_n = \lim_{n\to\infty}\frac{1}{(0.9)^n}$$

Let $\quad 0.9<1$

$$\lim_{n\to\infty}(0.9)^n = 0.$$

$a_n = \frac{1}{(0.9)^n} \to$ diverge to infinity

If $x<1$

$\lim_{x\to\infty} x^n = 0$

If $x>1$, then x^n diverges

Q49: $\quad a_n = \frac{\ln(n+1)}{\sqrt{n}}$

$$\lim_{n\to\infty} a_n = \lim_{n\to\infty}\left(\frac{\ln(n+1)}{\sqrt{n}}\right) \to \left(\frac{\infty}{\infty}\text{ form}\right)$$

using l opital rule.

$$\lim_{n\to\infty}\left(\frac{\frac{1}{n+1}}{\frac{1}{2\sqrt{n}}}\right) \to \left(\frac{\infty}{\infty}\text{ form}\right) \qquad \frac{2\sqrt{n}}{n+1}$$

again.

$$\lim_{n\to\infty}\left(\frac{2\frac{1}{2\sqrt{n}}}{1}\right)\lim_{n\to\infty}\left(\frac{1}{\sqrt{n}}\right) = 0. \to \text{convergen}$$

51) $a_n = (3/n)^{1/n}$

$\lim_{n\to\infty} a_n = \lim_{n\to\infty} (3/n)^{1/n}$ (0^0 form).

$\ln a_n = \ln (3/n)^{1/n}$ $\ln(0) \to \infty$.

$\ln a_n = \frac{\ln 3 - \ln n}{n}$.

$= \lim_{n\to\infty} \frac{0 - 1/n}{1}$ l'opital rule.

$\neq \lim_{n\to\infty} \frac{-1}{n} = 0.$

$\lim_{n\to\infty} \ln a_n = 0.$

(a_n is convergent)

$\Rightarrow a^n \Rightarrow e^0 = 1.$

Ex $a_n = \left(1 + \frac{x}{n}\right)^n$

$\ln a_n = n \ln (1 + x/n)$ ($\infty . 0$ form).

$\ln a_n = \ln(1 + x/n) / 1/n.$

$\lim_{n\to\infty} \ln a_n = \lim_{n\to\infty} \left(\frac{\ln(1 + x/n)}{1/n}\right)$ 0/0 form

$= \lim_{n\to\infty} \frac{\left(\frac{1}{1+x/n}\right)\left(\frac{-x}{n^2}\right)}{-1/n^2}$

$= \lim_{n\to\infty} \frac{x}{1+x/n.} = x.$

$\lim_{n\to\infty} a_n = e^x$

Rules.

1. $\lim_{n\to\infty} \sqrt[n]{n} = 0$
2). $\lim_{n\to\infty} x^{1/n} = 1$.
3) $\lim_{n\to\infty} \frac{x^n}{n!} = 0$.

$(3^3)^{1/3}$ $\neq 0$.

$\frac{1}{27}$

Q64 $a_n = (-4)^n/n!$

as $x^n/n! \to 0$. $\Rightarrow (-4)^n/n! \to 0$.

Recursive. definition

1) Values of initial Term(s).
2). Rule (Recursive formula).

1) $1, 2, 3,$ $a_1 = 1,$ $a_n = a_{n-1} + 1,$

2) $1, 2, 6, 24, \ldots$ $a_1 = 1,$ $a_n = n(a_{n-1})$

3) Fibonacci numbers:

$1, 1, 2, 3, 5, \ldots$

$a_1 = 1,$ $a_2 = 1,$ $\cancel{a_{n+1} = a_n}$ $a_{n+1} = a_n + a_{n-1}$

$a_n = a_{n-1} + a_{n-2}$ $n > 2$

$2,\ 2 + 1/2,\ 2 + \frac{1}{2 + 1/2},\ 2 + \frac{1}{2 + \frac{1}{2 + 1/2}}.$

$a_1 = 2,$ $a_n = a_1 + \frac{1}{a_{n-1}}.$

Bounded monoatomic seq.

→ 2, 4, 6, 8, ...
bounded from below. $a_n \geq m$

→ 1, 1/2, 1/3, 1/4, ... $a_n \leq M$
bounded from above. ∵ all are smaller than 1

If M is largest such no. then M is greatest lower bound.
If m is smallest such no. than m is least upper bound.

......, −2, −1, 0, 1, 2, ...
unbounded..

Non-decreasing sequence: ↔ ↑.

If $a_n \leq a_{n+1}$ ↑.
1, 1, 2, 3, 5, ...

— If $a_n \geq a_{n+1}$ → non-increasing seq.

— If seq is non-dec or non-incr. then seq is monotonic seq.

$a_n = \{1, 0, 2, 0, 3, 0, \ldots\}$
not monotonic.

— If a seq. is bounded and monotonic then the seq converges.

Ex 10.1   Q9, 26, 34, 47, 58, 69, 74

Binary coded decimal (BCD.

0 0000
1 0001
2 0010

largest nuber is 9 so we need 4 bits.

$(396)_{10} = (0011 \quad 1001 \quad 0110)_{BCD}$

This is BCD nuble not binary nuber.

2	396
2	198 - 0
	99 - 0
	49 - 1
	24 - 1
	12 - 0
	6 - 0
	3 - 0
	1 - 1

$(396)_{10} = (110001100)_2$

$(110001100)_2 \neq (0011 \quad 1001 \quad 0110)_{BCD}$

$(X)_2 \neq (X)_{BCD}$

$(1011001)_2$ $(1011001)_{BCD}$

$(89)_{10}$ $(131)_2$

$(0001 \quad 1000 \quad 0101)_{B.C.D} \neq (131)_2$

even → 1s.

$(0001 \quad 1000 \quad 0101 \quad 0)$ Bcd — Penalty bit (P.B) for even.

$(0001 \quad 1000 \quad 0101 \quad 1)$ B.C.D. — P.B for odd.

Binary no.(s).

unsigned | Signed. B.N

Signed mag. repres. | 2s complement representation

(1) unsigned no(s).

n-1 n-2 n-3 n-4 ... 3 2 1 0

mag only.

Range 0 to $2^n - 1$.

in 4Bit no. range.

$0 - 2^4 - 1$ 0-15 → 0000 — 1111

→ Bit extension: eg. making 6 bit no. from original 4 bits no

e.g 976. → (6. digit) 000976

$(9)_{10} = (1001)_2 = (0000 \quad 1001)_2$

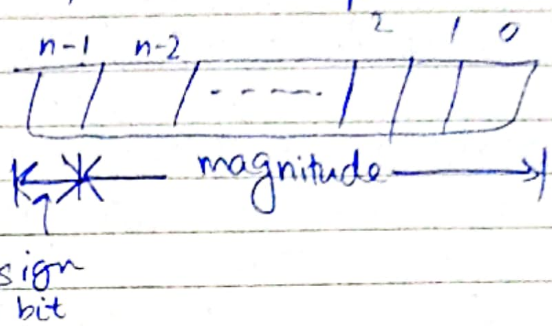
make in 8 digit

sign in binary form
'−' → 1
'+' → 0

(3) signed numbers : for n-bit rep.

e.g. 4 bit no.

+ve range.



0 000 → 0 111

+0 → +7

→ -ve. no. range from 1000 to 1 111
-0 to −7

→ for n bits (range).

$-(2^{n-1}-1)$ to $+(2^{n-1}-1)$

for 4 bit → range (+7) to (−7)

Bit extension 4 bit to 8 bit.

$(+9)_{10} = (01001)_2 \to (0000\ 1001)_2 = (+9)_{10}$

$(-9)_{10} = (1\ 1001)_2 \to (1\ 000\ 1001)_2 = (-9)_{10}$

signed mag. rep.

Decimal	Mag. rep. (signed mag.)	2's complement
+7	0111	0111
+6	0110	0110
+5	0101	0101
+4	0 100	01 00
+3	0011	0011
+2	0010	0010
+1	0001	0001
+0	0000	0000
−0	1 000	
−1	1 0001	0000
−2	1 010	1111
−3	1 011	1110
−4	1 100	1101
−5	1 101	1100
−6	1 110	1011
−7	1 111	1010
−8	11 100 0	1001
		1000

Cannot be rep. in 4 bits

3). Signed 2's complement representation.

→ 2's complement of N : (Algorith)

N = 10100100

→ 1). Start traversing bits from right to left.

2) - leave or cope all the data

3) - copy first 1 -

4) - Flip rest of the bits i.e. make 0 to 1 and 1 to 0.

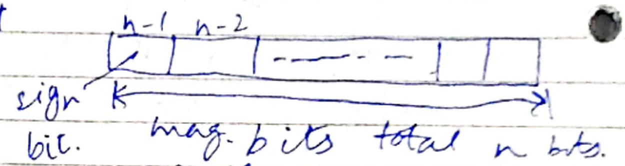
2's comp. of N = 01011100

→ Positive no are identical representation.

In both sys. left most bit represents sign.

→ 2's compl. in table (Back side)

→ signed 2's complement



2's comp. ↓ mag

Range 8 e.g. 4 bit no.

+ve no.s range.

0 000

to

0 111

-ve no. range. 1000 to 1111

2's comp. $-(1000)$ $(-8)_{10}$

1's comp $-(0001)$ $(-1)_{10}$

n-bit range

$-(2^{n-1})$ to $+(2^{n-1}-1)$

Bit extension.

What is $(0111)_2 = +7$. (sign)

4 to 8 bit.

(0 0000111)

$(1000)_2 = -8$

4 bit to 8 bit

$(1\ 1111\ 000)_2$

2's comp

(00001000).

In 2's comp. rep. -1 is used for bit extension

21 Feb

~~① Divide and~~

```
int a = 20
int &r = a.
cout << a ; // 10
r = 20
cout << a // 20.
int a = 10
int * p = &a.
cout << a  //10
*p = 20
cout << a //20.
```

4- Outfit   shalwar

③ → hook

Once. I went out of city in my village supposed for 2-3 hrs stay but due to some personal situations it became longer including a night stay. So I was wearing shalwar kameez, it helped me in such a way I can wear it during sleep time

① → S1 visit.

quality/clarity/relevancy/cohesion

Identity Culture Context

Cal-II

lect 3

22-Feb

$S_1 = a_1$

$S_2 = a_1 + a_2$

$S_3 = a_1 + a_2 + a_3$

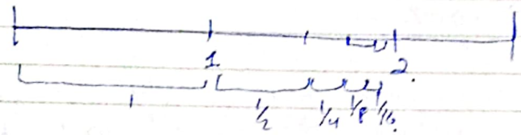
nth partial sum $S_n = a_1 + a_2 + a_3 + \dots + a_n = \sum_{k=1}^{n} a_k$

$\{S_n\} \rightarrow$ partial sum of series.

$S_n \rightarrow L$ (series converges.

and sum of series is L

$\sum_{n=1}^{\infty} a_n = L$, if S_n doesn't converge, so series diverges.



Geometric series.

$a + ar + ar^2 + \dots + ar^{n-1}$

$a \neq 0$, $a, r \rightarrow$ fixed.

$r \rightarrow$ ratio.

$1 + 1/2 + 1/4 + 1/8 + 1/16 \dots + \dots$

$a = 1$, $r = 1/2$.

$S_1 = a$ $\quad S_2 = a + ar$. $\quad S_n = a + ar + ar^2 + \dots ar^{n-1} \rightarrow (1)$

$rS_n = ar + ar^2 + ar^3 + \dots ar^n \rightarrow (2)$

(1),(2). $S_n - rS_n = a - ar^n$

$$S_n = a\frac{(1-r^n)}{(1-r)}$$

If $r = 1$, $\rightarrow S_n \rightarrow$ diverges $\rightarrow S_n = na = a + a + a + a \dots a$.

If $r = -1$ $\quad S_n = a - a + a - a + a \dots (-1)a \rightarrow$ series oscilates diverges.

e.g

If $|r| < 1$ then $S_n = a(1-r^n)/1-r$ $\quad r^n \rightarrow \infty$.

series converges to $a/1-r$.

If. $|r| > 1 \rightarrow$ series diverges.

10-03

$S_0 = 1 +$

$r = 3/5$

$(-1)^{n-1}2^{n-1}$

10.2 Q3 $1 - 1/2 + 1/4 - 1/8 + \dots + \cancel{9/100^n} + \dots$

Q13 $\sum_{n=0}^{\infty} \left(\frac{1}{2^n} + \frac{(-1)^n}{5^n} \right)$.

$S_0 = 1 + 1$, $S_1 = (1+1) + (1/2 - 1/5)$, $S_2 = (1+1) + (1/2 - 1/5) + \left(\frac{1}{2^2} + \frac{1}{5^2}\right)$

$S_3 = (1+1) + \left(\frac{1}{2} - 1/5\right) + (1/2^2 + 1/5^2) + (1/2^3 + 1/5^3)$

There are eight terms:

$= (1 + 1/2 + 1/2^2 + 1/2^3 + \dots + 1/2^n) + \left(1 - 1/5 + 1/5^2 - 1/5^3 + \dots \left(\frac{-1}{5}\right)^n\right)$

$= (1) \frac{1-(1/2)^n}{1-1/2} + \frac{(1)\ 1-(-1/5)^n}{1-(-1/5)}$.

If $n > 0$.

$\lim_{n\to\infty} S_n = (1) \frac{1-(1/2)^\infty}{1-1/2} + (1) \frac{1-(1/5)^\infty}{1-(1/5)}$ $\lim_{n\to\infty} S_n = 0$.

$= \frac{1}{1/2} + \frac{1}{6/5} = 17/6$.

$S_0 = \sum_{n=0}^{\infty} (2^{n+1}/5^n)$.

$\frac{1}{2}5^0$. $\frac{2/5^2}{1/5}$

$S_0 = 1/2$ 2. 2^{n-1}

$S_1 = 1/5$ $\frac{2 \cdot 5}{15^2}$

$S_2 = 2/5^2$.

$S_3 = 1/2 + 1/5 + 2/5^2 + 2^2/5^3$. $2/5$.

$S_4 = 1/2 + 1/5 + 2/5^2 + 2^2/5^3 + 2^3/5^4$.

$r = 2/5$ $S_8 = 1/2 + 1/5 + 2/5^2 + 2^2/5^3 + 2^3/5^4 + 2^4/5^5 + 2^5/5^6 + 2^6/5^7 + 2^7/5^8$.

$= \frac{(1/2)(1-(2/5)^n)}{(1-2/5)} = \frac{1/2}{3/5} = \frac{5}{6}$.

$= 2 \frac{(1-(2/5)^n)}{1-2/5}$ $\frac{2}{3/5} = \frac{10}{3}$

$(-2) + (-2)^2 + \dots + (-2)^n + \dots$

Geo. series with $r > 1$ → diverge.

→ Repeating decimals

When $|r| < 1$

$\frac{a}{1-r}$ = sum of serie

1.414414 ....

24. $1.\overline{414}$.

$$1.\overline{414} = 1 + \frac{414}{1000} + \frac{414}{(1000)^2} + \frac{414}{(1000)^3} + \dots \frac{414}{(1000)^{n-1}}$$

$$a = 1 + \frac{414}{1000} \left(1 + \frac{1}{1000} + \frac{1}{(1000)^2} + \dots \frac{1}{1000^{n-1}}\right)$$

$$S_n = \left(1 + \frac{414}{1000}\right)\left(\frac{1}{1 - 1/1000}\right) = \frac{1413}{999}$$

36. Telescoping series:

$$\sum_{n=1}^{\infty} \left(\frac{3}{n^2} - \frac{3}{(n+1)^2}\right).$$

$S_1 = 3 - 3/2^2$

$S_2 = 3 - \underbrace{3/2^2 + 3/2^2} + 3/3^2.$

$S_n = 3 - 3/2^2 + 3/2^2 + 3/3^2 - 3/3^2 + 3/4^2 + \dots - \frac{3}{n^2} - \frac{3}{(n+1)^2}$

$3 - 3/(n+1)^2.$

$\lim_{n\to\infty} S_n = 3 - \frac{3}{(n+1)^2} \left(\frac{3}{\infty}\right).$ 3

⇒ nth term test for divergence series.

The if $\sum_{n=1}^{\infty} a_n$ converges than $a_n \to 0$.

If $a_n \to 0$. then series may diverge.

If $\lim_{n\to\infty} a_n$ fails to exist or is different from 0. then $\sum_{n=1}^{\infty} a_n$ diverges.

eg. ① $\sum_{n=1}^{\infty} n^2 \rightarrow$ diverge as $n^2 \rightarrow \infty$.

② $\sum_{n=1}^{\infty} \frac{n+1}{n} = \lim_{n\to\infty} 1 + \frac{1}{n} = 1 + 0.$

1) Sal.
2) Ali
3) Ab
4) Burh
5) Hamza
6)

[5, 10, 25, 32] 10:2

English.

3P's ← Plan
Prepare ← Slide Preparation / Preparational aid
Present
↓
oral style
↓
language.

benefits using (chapter 13)

CH14

speak clearly

speaking appropriat

273-280

Structure of ppt.

sub text 24
Text 28.
heading 36-40
5x bullet pts/slide
Times new Roman
calibiri/seird

1) Intro
2) Middle
3) Concl.

DLD lect 4 23 Feb

2^n 2's complement.
formula $2^n - N$

⇒ Algos of subt. 1) Borrows method. 2) Using 2's comp.

$(\pm A) - (+B) = (\pm A) + (-B)$
$(\pm A) - (-B) = (\pm A) + (+B)$

Reason: In our processors hardware subt is not supported - we use add. hardware lesser hardw. fast process

Actual operation performed is addition taking 2's comp. before that if necessary

Ex: 6 − 13 = ?
we will do 6 + (−13) ⇒ add. will be performed.
1) ⇒ Chng.- 110 1101
2) ⇒ signed rep. 0110 +6. 01101 +13
3) Bit extension +6 = 00110. +13 = 001101.
4) ⇒ No. of bits same. +6 = 000 110
+13 = 001 101 → 2's comp. 110011 = −B.
5) A − B = A + (−B).
000110 → (+6)
+ 110011 → (−13)
0 1 1 0 0 1
we are done here let's check.
2's comp → 000111
(−7)

⇒ -6 - 13 = ?

-6 + (-13)

1) 6 = 110   13 = 1101

2) +6 = 0110   +13 = 01101

3) +6 = 00110   +13 = 001101

4) +6 = 000110   +13 = 001101

-A + -B → 2's comp

111010
110011
1001101

→ why we do bit extension -
we have same no. of bits available in 3 no(s) A, B, C
for eg. without bit extension. 8 - 8   C = A + B.

8 = 1000   -8 + (-8)
+8 = 01000

10000

→ why we discard last carry.
Ex.

13   1101   01101
      0110   00110

M - N   01101
         11010
       1 00111

discard

2's comp of N = $2^n - N$.

M-N, M-N = M + (-N)
M + (2^n - N)
2^n - M + (2^n)

discard

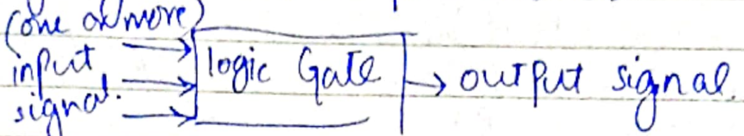
000111 + 100000 (2^5) discarded

+7

→ Hardware components that manipulate binary info. is called "digital circuit".

→ Digital circuits are perf. diff. operations.

→ Basic circuit is called logic gate ⇒ Base of all circuits - logic gates make complex circuits.



output of gates are applied to inputs of other gates ~~of~~ to form a digital circuit.

Electrical signal i.e. voltage/current exist throughout a digit system. in either of two recognizable value.

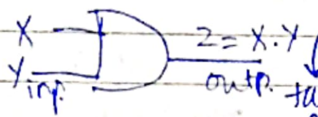
→ Each gate performs a specific logical operation - 3 basic ~~logical~~ operation associated with binary variables

- AND
- OR
- NOT

AND Gate: – Perf. AND oper.

Rep.: $Z = X \cdot Y$ or $Z = XY$ — Z is equal to X and Y

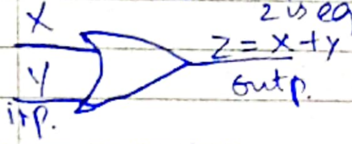
Grap



Truth table — table showing all posible i/o.

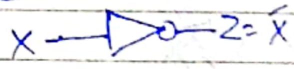
X	Y	Z=XY
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate → $Z = X + Y$ — Z is eq. to X or Y.



X	Y	Z=X+Y
0	0	0
0	1	1
1	0	1
1	1	1

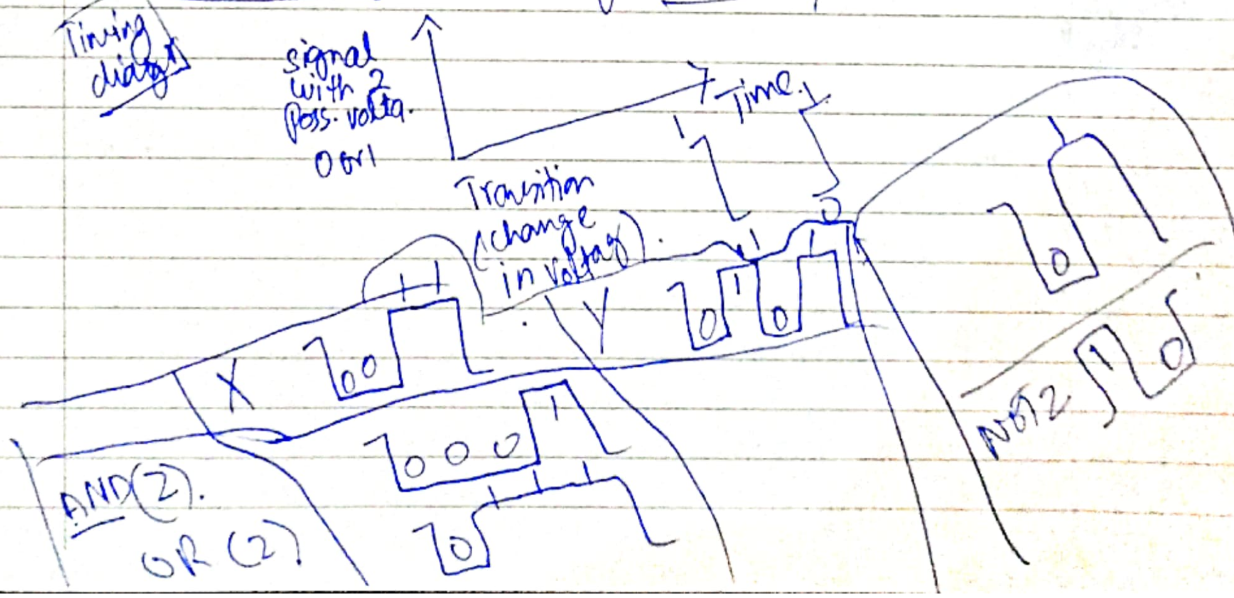
NOT Gate: $Z = \bar{X}$ Z equal to not X.



X	$Z = \bar{X}$
0	1
1	0

Timing diagram of AND, OR, NOT

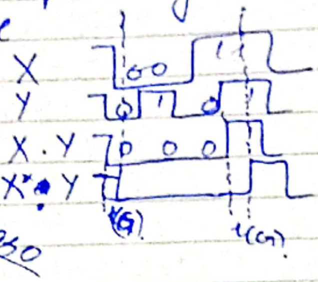
Timing diagr.



1- Abdul
2- Sift
3- Zesh.
4- Saad.
5- Suleiman

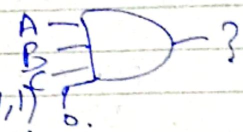
Gate Delay: → Property of gate.

1) The length of time it take for an input change to result in the corresponding output change
Denoted by t_{G}.
Depend upon.
→ Gate Type → No. of inputs.
→ circuit design → underlying of gate tech.

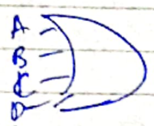


1930

Multiple inputs in gate.



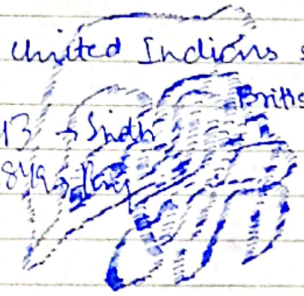
F = ABC. F will be one (A,B,C) = (1,1,1) & 0. and 0 othervise (for rest of comb.)



G = A+B+C+D. G will be zero (0) only when (A,B,C,D) = (0,0,0,0) for rest of cunpination it is 1.

War 100

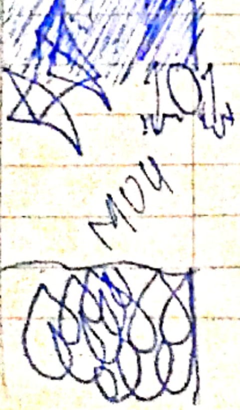
United Indians say → War of independence. } 1857
British ↓ → Mutiny.



1843 → Sindh
1849 → Punj

علی گڑھ Owl

MEC.
↓
1886
سرسید



MOU

1- enough knowledge

2- good thing → bad content.

3- wanted to engage.
   conclude.

4- hand gesture

5- posture.