PAGE No.
DATE / /

Binary → 2
Decimal → 10
octal → 8
Hexadecimal → 16

(÷) (x^n 4 +)

CONVERSION OF DECIMAL & TO DECIMAL.

To convert anything to Decimal (n, ----, 2, 1, 0) + powers

→ for eg: we are given 101_2 now we have to multiply the powers of 2 to each digit of 101 . & add them.

→ for eg: we are given 64_8, now we have to multiply the power of 8 to each digit of 64 & add then
↳ (descending order)

→ ① $101_2 = 1\times2^2 + 0\times2^1 + 1\times2^0$
$= 4+0+1 = 5 = 101$

→ ② $6~~3~~8_8 = 6\times8^1 + 8\times8^0$
$= 48+1 =$ ~~49~~ 51 (in octal $63_8 =$ ~~49~~ 51 in decimal)

→ ③ $(~~11~~)_{16} = 1~~0~~\times16^2 + 1\times16^1 + 0\times16^0$ ✗ $1\times16^1 + 10\times16^0$
$(110)_{16} = 256+16 = (272)_{10}$ $= 16+10 = 26 =$ (1A).

To convert decimal to binary (÷ by 2) → (remainder = Binary code)

→ for going decimal to binary → divide the given decimal number by 2 & (remainder is the binary code)

→ for eg: we are given 16 eg: we are given (17).

2	16	
2	8	0
2	4	0
2	2	0
	1	0

2	17	
2	8	1
2	4	0
2	2	0
	1	0

$= (10000)_2 = 16$ $(10001)_2 = 17$

decimal → octal ÷ by 8
→ binary ÷ by 2
→ hexa ÷ by 16.
} remainder = ans

PAGE No. DATE / /

To convert decimal to octal (÷ by 8) (remainder = octal code)

→ For going from decimal to octal, divide the decimal value by (8), the remainder we get is the octal code.

For eg: we are given $(26)_{10}$.

∴ 8 | 26
8 | 3 2 ↑

$(32)_8 = (26)_{10}$

eg: we are given $(44)_{10}$

8 | 44
5 4 ↑

$(44)_8 = (54)_{10}$.

To convert decimal to hexa decimal (÷ by 16) (remainder = hexa code)

→ For going from decimal to hexa decimal, divide decimal by (16), the remainder we get is hexadecimal value.

For eg: we are given $(26)_{10}$.

∴ 16 | 26
1 (10) → A = (14)

= $(110)_{16}$

* now if we get value in remainder betn (10 - 15), we write them as (A - F)

for eg : 16 | 46
2 (14) → (E)

(2E)

Binary → octal } seperate binary no. into parts
→ Hexa } of 8 digits & 4 digits
(octal) (Hexa)

PAGE No.
DATE / /

convert Binary to octal : (8 digits)

1. Take the binary code
2. Divide the binary code into parts of 8 digits
3. convert the parts of 3 digits to numbers
4. combine numbers.

for example : 10|011|11 0|001|

1. seperating binary into port of 3 digits.
→ 10 , 011 , 110 , 001 8 4 2 1.
2. conver 3 digit parts to numbers.
→ 2 , 3 , 6 , 1
3. combine numbers → $(2361)_8$

Convert binary to Hexadecimal (4 digits)

* similar to octal conversion

1. Take binary code.
2. Divide binary code into ports of 4digits
3. Convert parts of 4 digits to numbers.
4. combine.

For eg |10 0|1111|0 001|

1. seperate into 4 digits.
2. convert seperated 4 digits into numbers.

→ seperating into parts of 4 digits
→ 100, 1111, 0001
→ converting to number → 4, F, 1
= 4F1 //

octal & hexa decimal → Binary } ① convert to decimal ② Decimal to binary.

PAGE No.
DATE / /

Conversion of octal to Binary

① convert octal to Decimal.
i.e. muripy by powers of 8 in descending order. + add digits.

② Take the decimal number + make its binary.
→ by ($\div$ by 2) → remainder = binary

eg : $(63)_8$

① convert to decimal. 8^n.
$6 \times 8^1 + 3 \times 8^0 = 51$.

② decimal to binary. ($\div$ by 2)

2	51	
2	25	1
2	12	1
2	6	0
2	3	0
	1	1

$= (110011)_2$

Conversion of hexa decimal to Binary.

① hexa → decimal
② Decimal → binary.

① convert hexa decimal to Decimal.
→ multiply by powers of $(16)^n$ in decending order + then add.

eg : $(63)_{16}$
→ $6 \times 16^1 + 3 \times 16^0 = (99)_{10}$

② Decimal to Binary.
→ Divide by (2)

2	99	
2	49	1
2	24	1
2	12	0
2	6	0
2	3	0
	1	1

$(1100011)_2$

Octal to Hexa & Hexa to octal

① convert octal to Decimal

→ × by powers of (8) & (+)

② Take decimal & convert to hexa (÷ by 16)

eg: $(76)_8$

① convert octal to decimal.

$= 7 \times 8^1 + 6 \times 8^0$

$= 56 + 6 = (62)_{10}$

② Decimal to hexadecimal. (÷ by 16)

16 | 62

3 | 14 → E

$(3E)_{16}$

① Convert hexa to Decimal

→ × by powers of (16) & (+)

② Take decimal & convert to octal (÷ by 8)

eg: $(1A)_{16}$ (A = 10)

① convert hexa to Decimal

$= 1 \times 16^1 + 10 \times 16^0$

$= 16 + 10 = (26)_{10}$

② Decimal to ~~hexa~~ octal (÷ by 8)

8 | 26

3 | 2

$= (32)_8$

Eg Decimal to Binary

① $(13.375)_{10} \rightarrow$ Binary :

~~1×2+0~~	2	13	
	2	6	1
	2	3	0
		1	1

(1101) .

= (1101.011)

375 → ~~0.375~~ 0.375 × 2 = 0.750 → 0.

→ 0.750 × 2 = 1.500 → 1

→ 0.500 × 2 = 1.00 → 1.

= (011)

* Keep multiplying by 2, till we get ①.

Sign Magnitude Method :

* 1 bit is reserved for sign of the number . i.e. (MSB) .
  * 0 = +ve
  * 1 = -ve

* Remaining bits are the number .

Eg (+4) (-ve 4)

= 0100 = 1100
↳ signbit .

Eg						
4	0100	4	0100	∴		0100
+3	0011	-3	⊕ 1011		−	0011
7	0111		1111			0001

compare & subtract → -4 = 1100

+3 ⊖ 0011

-1 1001 = (-1) .

#

PAGE No.
DATE / /

* 1s complement Method: (invert all bits of +ve no = -ve no)

* For +ve same as sign magnitude method.

i.e. +13 = 0 1101

* For -ve

① need to invert all bits of same +ve no.

eg: -13 in 1^s complement:
= invert all bits of +13
i.e = 0 1101 = +13
now invert all bits
∴ (-13 = 10010)

* invert
1 → 0
of +ve
= -ve

* 2s complement Method (1^{st} complement +1)

* For +ve no. same as sign magnitude method

i.e. +13 = 0 1101

* For negative numbers

① Take 1^s Complement
(i.e. invert bits of same +ve no)

② Add (+1) to 1^s complement.

eg: -13 in 2^s complement

① Take 1^s complement (invert bits of +13)
= 01101 = +13
∴ -13 in 1^s complement = 10010

→ +13 = 01101
∴ 1s complement
= -13 = 10010
in 2s complement
= 1s complement +1
= 10010 +1 = 10011

∴ -13 in 2^s complement = (1^s complement +1)
= 10010 +1 = (10011) = -13 2^s compl.

PAGE No.
DATE / /

Rules for addition

A	+ B	sum	carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

1+1 = 0 carry 1.

Rules for substraction

A	− B	diff	burrow carry
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0.

(0−1) = 1 burrow = 1.

* 35 − 28 = 35 + (−28)

−28 = 2s complement or 1s complement.

1s complement addition (add carry to answer)

eg: 35 + (−28)

1. take 1s complement of (−28).
2. Add 35 + 1s complement of (−28)

3. If carry is generated, add that to answer)

2s complement addition (ignore if carry is generated)

eg: 35 + (−28)

1. take 2s complement of 28.
2. Add 35 + 2s complement of (28).
3. (If carry is generated, ignore)

Classification of codes

* Weighted codes → Binary, 8421, 2421, etc.
  → each position represent some value.

* Non weighed codes → XS-3 code, Gray code.

* Alphanumeric code → ASCII code.

Binary coded Decimal : (binary code for each digit) (4bit)

* ① Each decimal digit is represented by a 4 bit binary number.

Basically, write binary code for each digit.

Decimal	BCD (same as binary just 4 bits).
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

Decimal to BCD.

* $(10)_{10}$ = 1 0
  = 0001 0000
  = $(00010000)_{BCD}$.

* $(13)_{10}$ = 1 3
  = 0001 0011
  = (00010011) BCD

* $(17)_{10}$ = 1 7
  = 0001 0111
  = (00010111) BCD

~~BCD to~~ Decimal to BCD :

① Take decimal no.

② write the binary code for (each digit) of decimal.

eg: $(227)_{10}$

= 2 = 0010 → (0010 0010 0111)

2 = 0010

7 = 0111

BCD to Decimal : (group BCD into 4 bits) & (then calc. decimal value)

similar to binary to hexa

① Group the ~~BCD~~ BCD into 4 bit group. &.

② Take decimal value of 4 bit groups.

eg: |0010|0010|0111|

① ② ③.

① ⇒ 2

② ⇒ 2 = $(227)_{10}$

③ ⇒ 7

Eg 10 in binary

10 = 1010

10 in BCD

10 = 1 + 0.

= (0001 0000)

PAGE No.
DATE / /

(self complementing)

Excess -3 code (XS - 3 code) Add 3 to BCD.

Add 3 to BCD

** convert Decimal to XS - 3 code.

① . convert Decimal to BCD.
② Add (0011) (3) to BCD.
= XS 3 code

eg: 5 → BCD = 0101 → BCD + 3 = 0101
+ 0011
XS -3 code for 5 = 1000 = 8

Decimal	BCD	BCD + 3
0	0000	0000 + 0011 = 0011
1	0001	0001 + 0011 = 0100
2	0010	= 0101
3	0011	= 0110
4	0100	= 0111
5	0101	= 1000
6	0110	= 1001
7	0111	= 1010
8	1000	= 1011
9	1001	= 1100

∴ XS 3 code for 24.
① convert 24 to BCD.
② Add 0011 to BCD 24.

→ BCD 24 = 0010 0100
→ BCD 24 + 3 = 0010 0100
+ 0011
0010 0111 = XS 3 code for 24

PAGE No.
DATE / /

XS - 3 code for digits above 9.

① Take the BCD of the number.

② Add 3 to $\boxed{\text{each}}$ bcd value of the number.

Eg XS - 3 code for 24.

① BCD of 24 = 2 4.

(0010 0100)

② Add (0011) to 2 BCD & (0011) to 4 BCD.

= 0010 0100
+ 0011 + 0011
0101 0111

= (01010111)

Eg. XS 3 code for 156.

① BCD of 156 = 1 5 6.

0001 0101 0110

② Add 3 to $\boxed{\text{each}}$ digit BCD.

= 0001 0101 0110
+ 0011 + 0011 + 0011
0100 1000 1001

= 0100 1000 1001

\# Binary → Gray } MSB remains
Gray → Binary } the same.

PAGE No. | DATE / /

\# Graycode: $Y = A\bar{B} + \bar{A}B$ (XOR)

- Reflected Binary Code (RBC).

* two successive value differs in only one bit.

* Binary number is converted to Gray code to reduce switching operation.

	Binary				Gray			
	B_3	B_2	B_1	B_0	G_3	G_2	G_1	G_0
3	0	0	1	1	0	0	1	0
4.	0	1	0	0	0	1	1	0

∴ to change from 3 to 4, we need to change 3 bits.

∴ to change from 3 to 4 in Gray code we need to change only one bit.

\# Binary to Graycode Conversion

① Record MSB as it is

* ② Add MSB to next bit, record the sum neglect carry

③ Repeat ②.

* Eg convert 1011 to Gray code.

→ 1 0 1 1
↑
MSB.

① Record MSB as it is. = 1.

② Add MSB to next bit = 1 + 0 = 1.
(record sum, neglect carry).

repeate process

= 0 + 1 = 1 = (1110)

= 1 + 1 = 0

Binary to Gray:

① Record MSB

② Add 1st & 2nd pos
Add 2nd & 3rd pos
Add 3rd & 4th pos

Record sum ignore carry.

-- continue till last element

eg: 1110.

MSB = 1.

1+1 = 0.

1+1 = 0 = (1001)

1+0 = 1

1 1 1 0
↓ +1 +1 +1
1 0 0 1

PAGE No.
DATE / /

Gray code to Binary Conversion: [~~same as Binary to Gray~~]

① Record MSB as it is.

②. Add MSB to next bit of gray code.

Basically
~~① Record MSB~~
~~② Add 1st & 2nd position.~~ ~~① record sum~~
~~Add 2nd & 3rd position~~ ~~② Ignore carry.~~
~~Add 3rd & 4th position~~

~~Eg: 1110 → Gray code.~~
~~= 1, 1+1 = 0, 1+1 = 0, 1+0 = 1~~
~~= 1001~~

eg: 1110 → Gracode.
= 1 1 1 0
+ 0 +1 +0 +1
1 0 1 1

$B_1 = G_1$
$B_2 = G_2 \oplus B_1$
$B_3 = G_3 \oplus B_2$
$B_4 = G_4 \oplus B_3$

Basically

① Record MSB + 0 = MSB.

② Add MSB + 0 = MSB to next bit. = sum ①.
Add sum ① to next bit = sum ②.
Add sum ② to next bit = sum ③.

MSB x y z.
+ 0 +MSB +sum1 +sum2
MSB sum1 sum2 sum3.

Basically add result of previous sum to next bit

eg. 1 0 0 1 (Gray code)
+1 +1 +1
1 1 1 0

if 1001 = binary to Gray
∴ 1, 1+0, 0+0, 0+1
= (1101)

PAGE No.
DATE / /

ASCII - codes (Group 7 bits in binary).

* 48 - 57 = 0 to 9.
* 65 - 90 = A - Z capital.
  97 - 122 = a - z small

ASCII

Binary → Decimal → Ascii

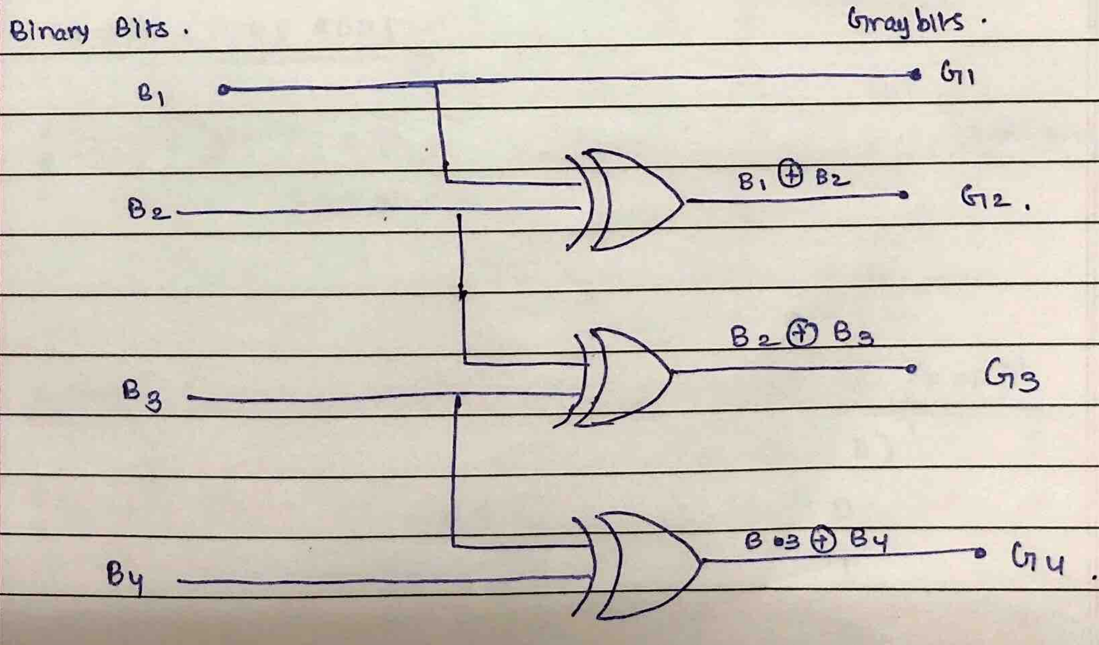
Group 7 bits in binary.

convert each group to decimal.

$\underbrace{1010001}_{81}\underbrace{1001011}_{75}$

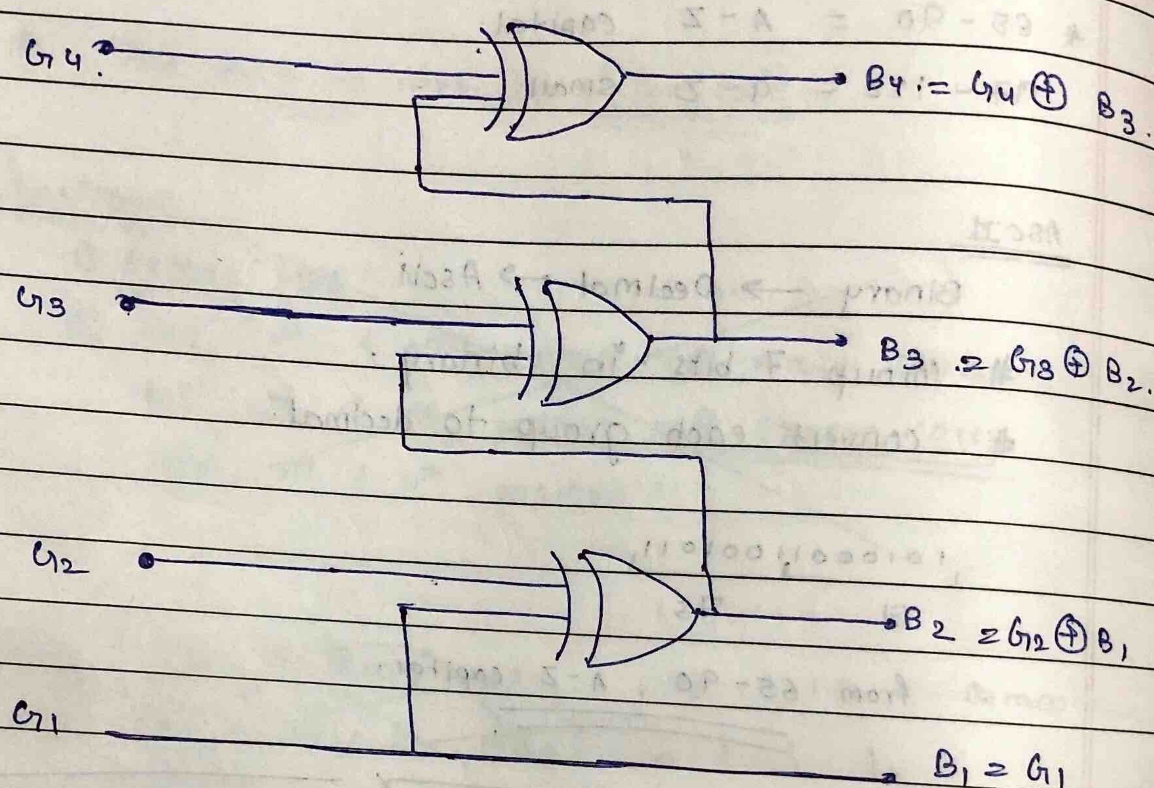
∴ from 65-90, A-Z capital.

Binary to Gray code = XOR. (Just apply XOR).



Gray code to Binary (XOR logic)

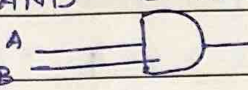
Gray code — Binary.



~~BCD to XS 3 code~~

Basic Logic Gates

① AND (Multiply).

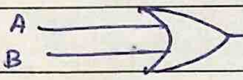


$Y = A \cdot B$

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

AND (x).

② OR (ADD).



$Y = A + B$

$1+1 = 1$.

A + B		Y
0	0	0
0	1	1
1	0	1
1	1	1

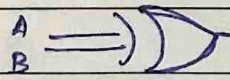
OR (Y).

③ NOT (complement).

A	Y
1	0
0	1

NOT (complement).

④ X OR (PURE ADDITON)



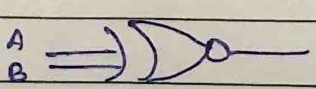
$Y = A \oplus B$

$= \bar{A}B + A\bar{B}$

A ⊕	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

XOR (pure addition)

⑤ X-NOR (pure addition)' = complement of (XOR)'



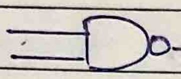
$Y = (A \oplus B)'$

$= \overline{AB} + AB$

(A ⊕	B)'	Y
0	0	1
0	1	0
1	0	0
1	1	1

$\boxed{(XOR)' = XNOR}$

6. **NAND** $X = (A \cdot B)'$ (complement of AND)

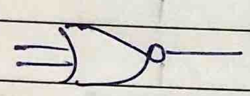


$Y = (AB)'$

$(A$	$\cdot$ $B)'$	Y.
0	0	1
0	1	1
1	0	1
1	1	0.

7. **NOR** $X = (A + B)'$ (Complement of (OR)

OR = $(1+1 = 1.)$



$Y = (A + B)'$

$(A$	$+$ $B)'$	Y
0	0	1
0	1	0
1	0	0
1	1	0

serial → use AND.

parallel → use OR.

PAGE No.

DATE / /

Boolean Algebra

* Commutative law

10. $A + B = B + A$
11. $A \cdot B = B \cdot A$

* Associative law

12. $(A+B)+C = A+(B+C)$
13. $(A \cdot B) \cdot C = A \cdot (B \cdot C)$

* Distributive law

14. $A \cdot (B+C) = AB + AC$
15. $A + (B \cdot C) = (A+B) \cdot (A+C)$

Duality theorem

1. change each OR to AND
2. change each AND to OR
3. complement each 0 & 1

Fundamental laws:

* AND laws

$x = 1 \quad x' = 0.$

1. $x \cdot x = x.$
2. $x \cdot 1 = x$
3. $\boxed{x \cdot 0 = 0}$ AND Gate
4. $\boxed{x \cdot \bar{x} = 0}$

because $x = 1$, $\bar{x} = 0.$

* OR laws.

$A = 1, \ \bar{A} \ \& \ A' = 0$

5. $A + 0 = A$
6. $\boxed{A + 1 = A}$ $\quad 1+1 = 1$ OR (Gate.)
7. $A + A = A$
8. $\boxed{A + \bar{A} = 1}$ $\quad 1+0 = 1$ OR

$0+1 = 1$

9. $\bar{\bar{X}} = X$
10. Top of page

Dual of Distributive law

15. $x + (yz) = (x+y) \cdot (x+z)$

Demorgans = $\overline{A+B} = \overline{A}\cdot\overline{B}$

$\overline{A\cdot B} = \overline{A}+\overline{B}$

PAGE No.

DATE / /

DeMorgans Theorem

* $\overline{A+B} = \overline{A}\cdot\overline{B}$
* $\overline{A\cdot B} = \overline{A}+\overline{B}$

converting AND to OR

OR

OR TO AND

Identity Theorem :

* $x + (\overline{x}\,y) = (x+y)$
* $x\cdot(\overline{x}+y) = (x\cdot y)$

→ $x + (\overline{x}\,y)$

$= (x+\overline{x})\cdot\cancel{(x+y)} = \cancel{(x+y)}$.

$x=1$, $\therefore \overline{x}=0$.

$=$ ~~0 2 (x+x) = 1~~.

$x+\overline{x}=1$ $x=0$, $\overline{x}=1$.

$\therefore (x+\overline{x}) = 1$.

→ $x(\overline{x}+y) = x\cdot y$.

$(x\cdot\overline{x}) + \cancel{(y\cdot x)} = \cancel{(x\cdot y)}$.

$0 + (y\cdot x) = (x\cdot y)$

$1 + \text{any input} = 1$.

$A=1, \bar{A}=0, B=1, \bar{B}=0$.

(Q1) $Y = \bar{A}B + A\bar{B} + AB$.

take A common.

$\bar{A}B + A(\bar{B}+B)$. $\because \underline{\bar{B}+B = 1}$.

$\bar{A}B + A$

$\therefore (C+AD) = (C+A)\cdot(C+D)$

$\therefore (A+\bar{A})\cdot(A+B)$

$\therefore \underline{(A+\bar{A}) = 1}$.

$\therefore \underline{\underline{(A+B)}}$.

(Q2). $Y = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C$

take $\bar{B}C$ common.

$Y = \bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{B}C(\bar{A}+A)$.

$\therefore (\bar{A}+A) = 1$.

$= \bar{A}B\bar{C} + \underline{A\bar{B}\bar{C} + \bar{B}C}$

take $\bar{B}$ common.

$= \bar{A}B\bar{C} + \bar{B}((A\bar{C})+C)$.

$= \bar{A}B\bar{C} + \bar{B}[(A+C)\cdot(C+\bar{C})]$

$(C+\bar{C}) = 1$.

$= \bar{A}B\bar{C} + \bar{B}[A+C]$.

$= \underline{\underline{\bar{A}B\bar{C} + A\bar{B} + A\bar{C}}}$.

(Q3) $F = \bar{y}\bar{z} + \bar{w}x\bar{z} + \bar{w}x\bar{y}\bar{z} + y\bar{z}$

take $\bar{y}\bar{z}$ common.

$= \bar{y}\bar{z}(1+\bar{w}x) + \bar{w}x\bar{z} + y\bar{z})$

$(x+1) = x$.

$= \underline{\bar{y}\bar{z}(1)} + \underline{\bar{w}x\bar{z}} + \underline{y\bar{z}}$

take $\bar{z}$ common.

$\bar{z}(\bar{y}+y) + \bar{w}x\bar{z} = \underline{\underline{\bar{z} + \bar{w}x\bar{z}}}$.

$(\bar{y}+y) = 1$.

$\bar{z} + \bar{w}\bar{x}\bar{z}$

take $\bar{z}$ common.

$\bar{z}(1 + \bar{w}\bar{x})$

$(x+1) = 1 \quad \because x = 1$

$= \bar{z}$

Solving XNOR.

$\rightarrow \bar{A}\bar{B} + AB$

$\rightarrow \overline{\bar{A}B + A\bar{B}}$

$= \overline{x+y} = \bar{x} \cdot \bar{y}$ demorgans.

$\overline{\bar{A} \cdot B} \cdot \overline{A \cdot \bar{B}}$

= again demorgans.

$= (\bar{\bar{A}} + \bar{B}) \cdot (\bar{A} + \bar{\bar{B}})$

$= (A + \bar{B}) \cdot (\bar{A} + B)$.

$= A\bar{A} + AB + \bar{A}\bar{B} + B\bar{B}$

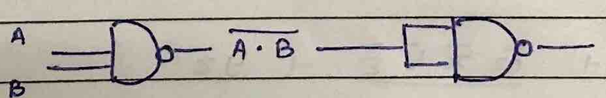
$\therefore A\bar{A} + B\bar{B} = 0$.

$= \underline{(AB + \bar{A}\bar{B})}$.

Construct AND using NAND.

$\therefore (A \cdot B)' \rightarrow A \cdot B$. (2 Nand Gates)

$\boxed{\text{2 nand gates series}}$



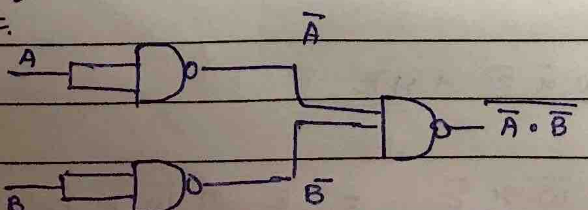
$A \cdot B$ = And Gate.

Construct OR using NAND. $(A + B) \leftarrow (A \cdot B)'$.

short input

2 nand gates parallel

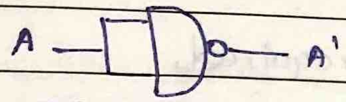
again nand gate



Apply demorgan to $\overline{\bar{A} \cdot \bar{B}}$

$= \bar{\bar{A}} + \bar{\bar{B}} = \underline{(A + B)}$.

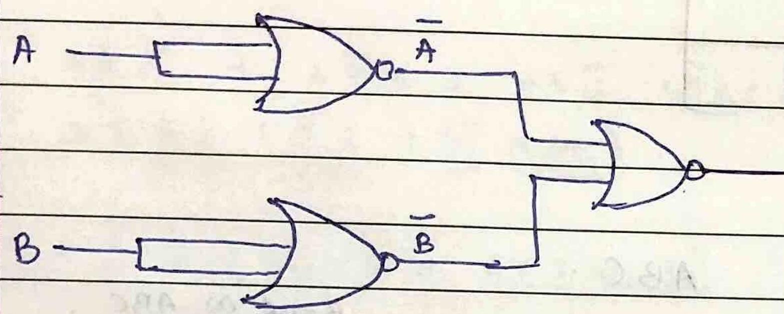
NOT using NAND : $(A \cdot B)' \rightarrow A'$



Construction of AND using NOR

$(A + B)' \rightarrow A \cdot B$.

2 NOR in parallel 4 other NOR Gate.

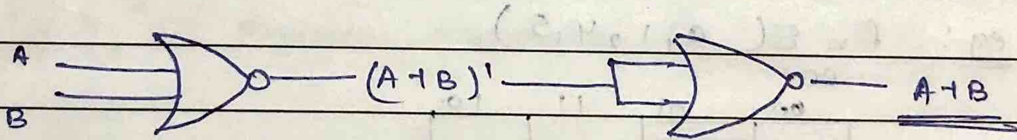


$\overline{\bar{A} + \bar{B}}$ apply demorgans.

$= \bar{\bar{A}} \cdot \bar{\bar{B}} = A \cdot B$

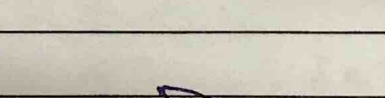
$=$ AND

OR Gate using NOR $(A+B)' \rightarrow A+B$.



= OR gate

NOT Gate using NOR



= NOT Gate .

$\bar{A} = 0 \quad A = 1$

Kmap is always made for ~~Input~~ Output

PAGE No.
DATE / /

K-maps

$N = 2^n$, N = no. of cells required

n = no. of variables in boolean exp.

Two variables →

	B	$\bar{B}$
A	AB	~~$A\bar{B}$~~
$\bar{A}$	$\bar{A}B$	$\bar{A}\bar{B}$

	B	$\bar{B}$
$\bar{A}$		
A		

A \ B	B	$\bar{B}$
A		
$\bar{A}$		

Three variables → ABC.

A \ BC	00	01	11	10
0				
1				

Read as ABC.

eg: $f = \Sigma(0, 1, 4, 5)$

A \ BC	00	01	11	10
0	1	1		
1	1	1		

quad → $\bar{B}$

4 variable kmap.

AB \ CD	00	01	11	10
00				
01				
11				
10				

| group 1 | (SOP)

KMap for Minterm 1.

PAGE No.
DATE / /

Ex. Plot eqn $AB + A\bar{B} + BC$.   (Three variable.

A \ BC	00	01	11	10
0		1	1	
1	1	1	1	1

* All spots where A & B are 1
* All spots where A = 1 & B = 0.
* All spots where B & C = 1.

$A + \bar{B}C$

$A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$.

$A(\bar{B}\bar{C} + \bar{B}C + B\bar{C} + BC)$.

$A(\bar{B}(\bar{C}+C) + B(\bar{C}+C))$ $\bar{C}+C = 1$.

$A(\bar{B}+B) = A$ $\bar{B}+B = 1$.

$F = A + \bar{B}C$ Three variables.

$2^3 = 8$ prepare truthtable for $A + \bar{B}C$..

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

$F = (\bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC)$..

= (for which F = 1)

$= \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$

$= \bar{A}\bar{C}(B+\bar{B}) + AB(\bar{C}+C) + ABC$

$= \bar{A}\bar{C} + AB + ABC$.

$= \bar{A}\bar{C} + AB(1+C)$.

$= \bar{A}\bar{C} + AB$.   -- $1+x = 1$.

PAGE No.
DATE / /

$1 \longrightarrow$ Minterm

$0 \longrightarrow$ max term

A \ BC	00	01	11	10
0				1
1	1	1	1	1

$A + B\bar{C}$

Q) $F(A,B,C) = SOP\ (1,3,5,7)$.

A \ BC	00	01	11	10
0	0	1	1	
1		1	1	

$\Rightarrow C$

group ⓪ [POS]

PAGE No. | DATE / /

k map for max term ⓪.

eg $F(A,B,C,D) = \Sigma m(1,3,4,5,9,11,14,15)$.
↳ min terms (1).

$= \Pi m(0,2,6,7,8,10,12,13)$.
↳ max terms (0).

∴ $2^4 = 16$.

AB \ CD	00	01	11	10
00	0			0
01			0	0
11	0	0		
10	0			0

$(\bar{B}\bar{D}) + AB\bar{C} + \bar{A}BC$

4 write it as, invert everything / complement everthing.

$= (B + D) \cdot (\bar{A} + \bar{B} + C) \cdot (A + \bar{B} + \bar{C})$.

① change A to $\bar{A}$
4 change (· to +) 4 (+ to ·)

Standard forms

Sum of products (SOP) → minterms → 1 . (Σ) / (Σ).

SOP eqn = ABC + DEF.

Product of sum (POS) → maxterm → 0 . (Π).

POS eqn = $(A+B+C)\cdot(\bar{B}+C+D)$

→ solved similar to SOP,
1. Plot '0' in the k map instead of 1.
2. Group '0' instead of 1
3. Get eqn in the form of SOP.
4. convert SOP → POS.
   → change (·) to (+) & viceversa.
   → change $\bar{A} \to A$ & viceversa

SOP (minterms) POS (maxterms)