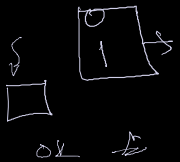
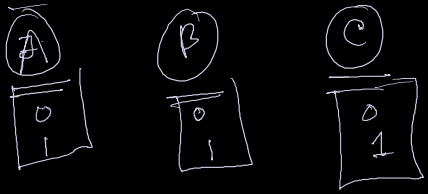

0
1
ok


A
0
1
B
0
1
C
0
1

A	B	C	R
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

8 gates TT → Eqn → Normalization → CKt

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

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

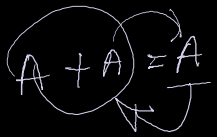
$= BC(\bar{A}+A) + AC(\bar{B}+B) + AB(\bar{C}+C)$

$= BC \cdot 1 + AC \cdot 1 + AB \cdot 1$

$= BC + AC + AB$

$= AB + BC + CA$

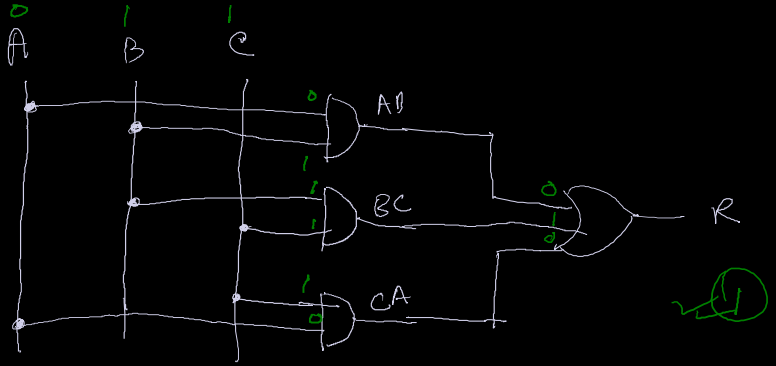
↳ 4 gates



$A + \bar{A} = 1$

$A \cdot 1 = A$

$$R = AB + BC + CA$$



XOR

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

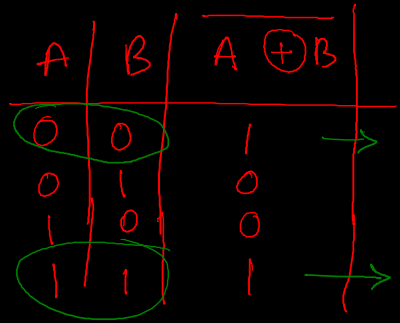
Eqn

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

XOR ডেরিভেটিভ সমীকরণ

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

XOR



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

Encoder

Big → Small

8 bit data

$2^8 = 256$

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	4 X_2	2 X_1	1 X_0
0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	1	0	0	0	0	1	0	0
0	0	1	0	0	0	0	0	1	0	1
0	1	0	0	0	0	0	0	1	1	0
1	0	0	0	0	0	0	0	1	1	1

8×3 Encoder

$2^3 \times 3$ Encoder

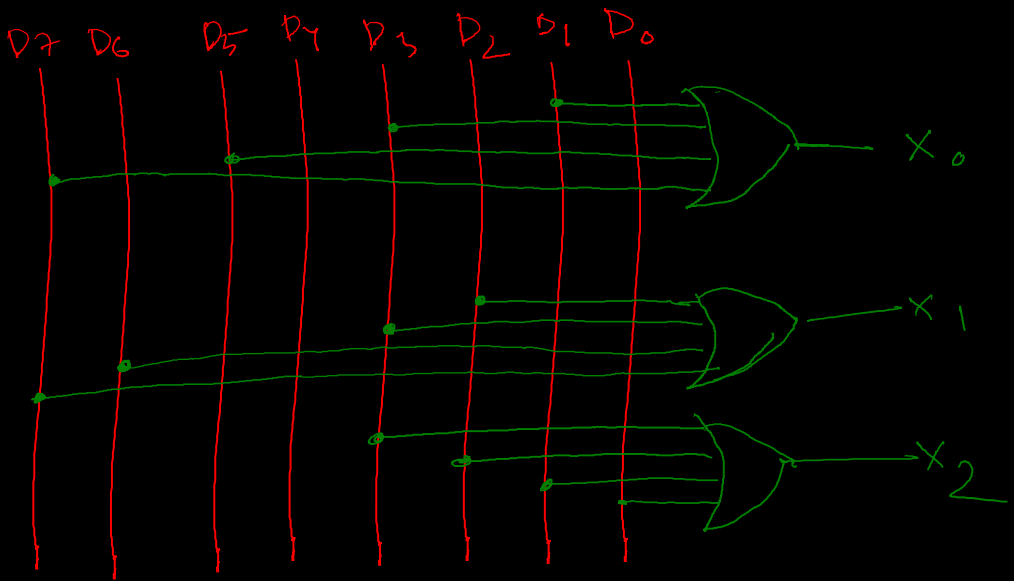
$2^n \times n$ Encoder

$8 = 2^3$ 3 bit

$$X_0 = D_1 + D_3 + D_5 + D_7$$

$$X_1 = D_2 + D_3 + D_6 + D_7$$

$$X_2 = D_4 + D_5 + D_6 + D_7$$



8 × 3 Encoder circuit

8 x 3 Encoder

3 x 8 Decodar

i/p o/p

A.W

Decoder

Half Adder

2 bit addition

→ Sum =

→ Carry =

$$\begin{array}{r} 0 \\ +\ 0 \\ \hline 0 \end{array}$$

S → 0

C → 0

$$\begin{array}{r} 0 \\ +\ 1 \\ \hline \end{array}$$

S → 1

C → 0

$$\begin{array}{r} 1 \\ +\ 0 \\ \hline \end{array}$$

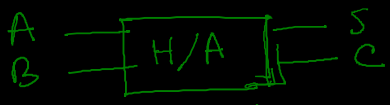
S → 1

C → 0

$$\begin{array}{r} 1 \\ +\ 1 \\ \hline \end{array}$$

S → 0

C → 1



Task: draw detailed ckt.

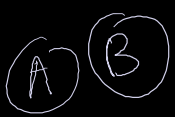
II

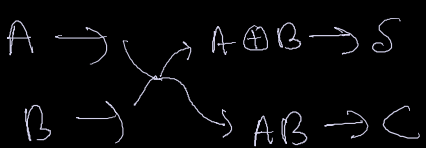
I/P A	I/P B	O/P Sum S	O/P Carry C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

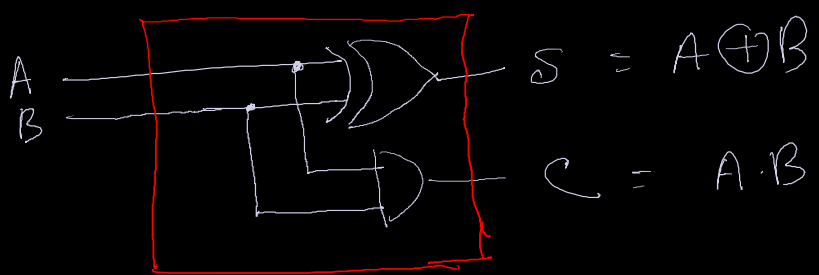
$S = \bar{A}B + A\bar{B}$

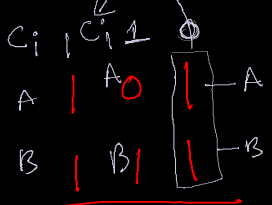
$= A \oplus B$

$C = AB$







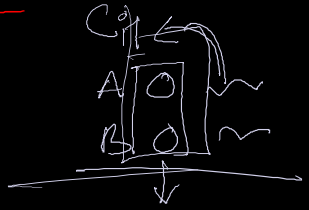


S=1 S=0 → S=0

C=1 C 1 → C=1

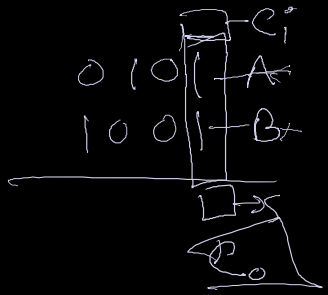
A	B	Ci	S	Co
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

F



S = X

Co = X



i/p → A , B , C_i

o/p → S , C_o

$$S = \bar{A}\bar{B}C_i + \bar{A}B\bar{C}_i + A\bar{B}\bar{C}_i + ABC_i$$

$$C_o = \bar{A}BC_i + A\bar{B}C_i + AB\bar{C}_i + ABC_i$$

$$S = \bar{A}\bar{B}C_i + \bar{A}B\bar{C}_i + A\bar{B}\bar{C}_i + ABC_i$$

$$= C_i\left(\bar{A}\,\bar{B} + AB\right) + \bar{C}_i\left(\bar{A}B + A\bar{B}\right)$$

$$= \underbrace{C_i}_{X}\;\underbrace{\overline{A \oplus B}}_{\bar{Y}} + \underbrace{\bar{C}_i}_{\bar{X}}\;\underbrace{A \oplus B}_{Y}$$

$$\bar{X}Y + X\bar{Y} = X \oplus Y$$

$$= C_i \oplus A \oplus B$$

$$\boxed{S = A \oplus B \oplus C_i}$$

XOR

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

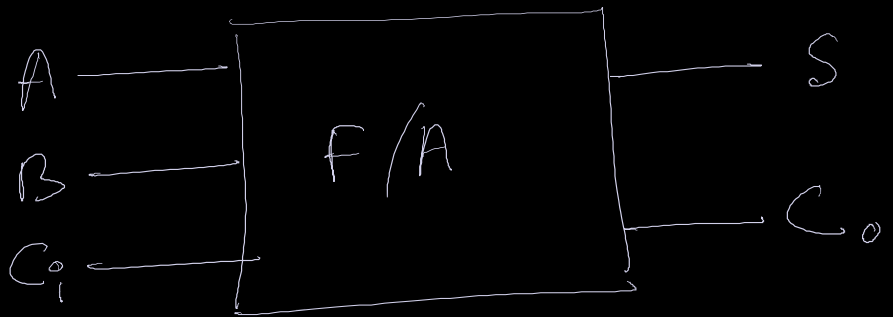
XNOR

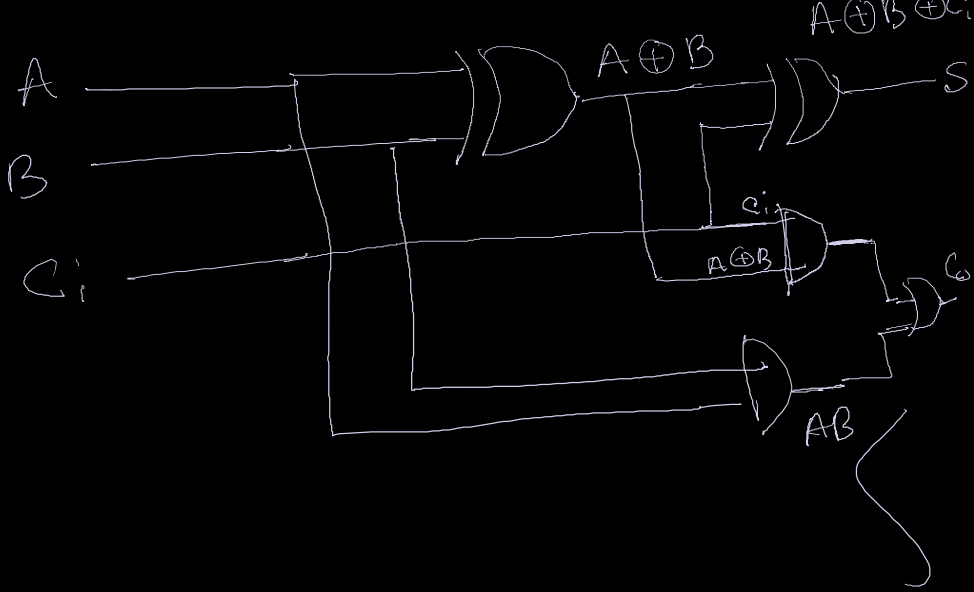
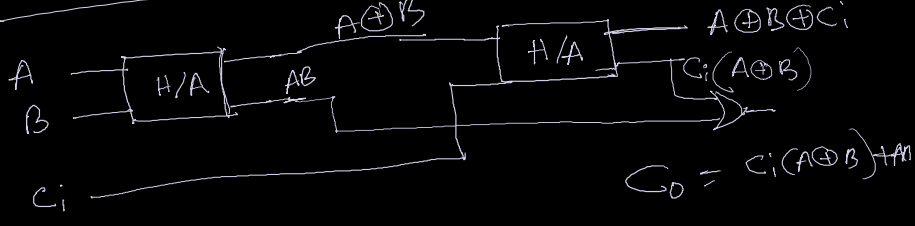
$\bar{A}\bar{B} + AB$

$$C_0 = \bar{A}BC_i + A\bar{B}C_i + AB\bar{C}_i + ABC_i$$

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

$$= C_i(A \oplus B) + AB$$


A
B
C_i
F/A
S
C_o


A
B
C_i
A⊕B
A⊕B⊕C_i
S
C_i
A⊕B
C_o
AB

H/A দিয়ে F/A তৈরিকরণ