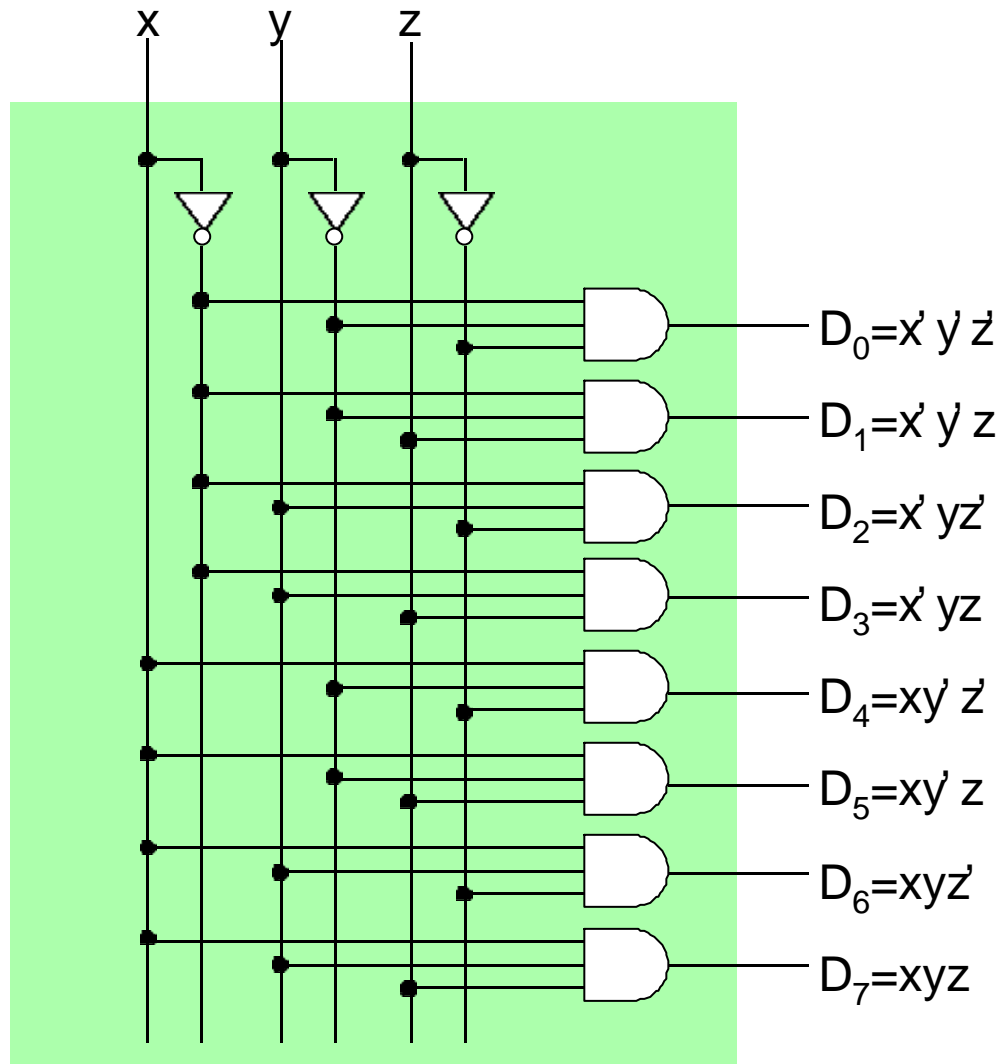


3x8 Decoder

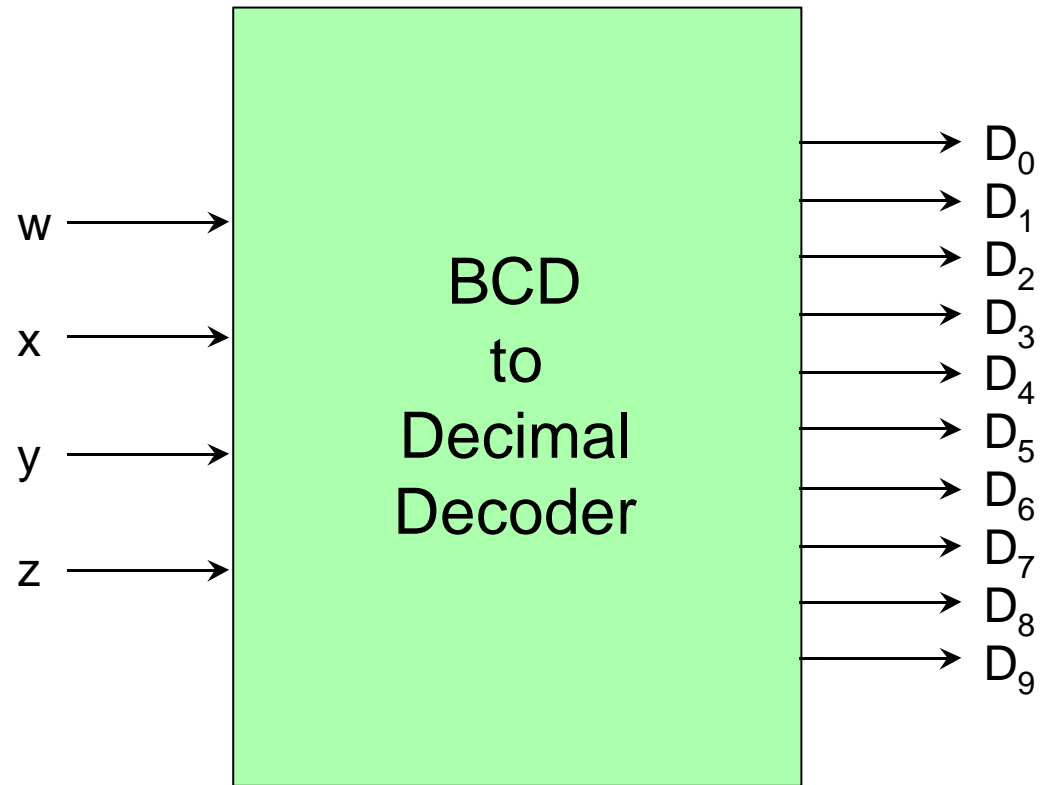


BCD to Decimal Decoder

□ BCD code

BCD code

“1”



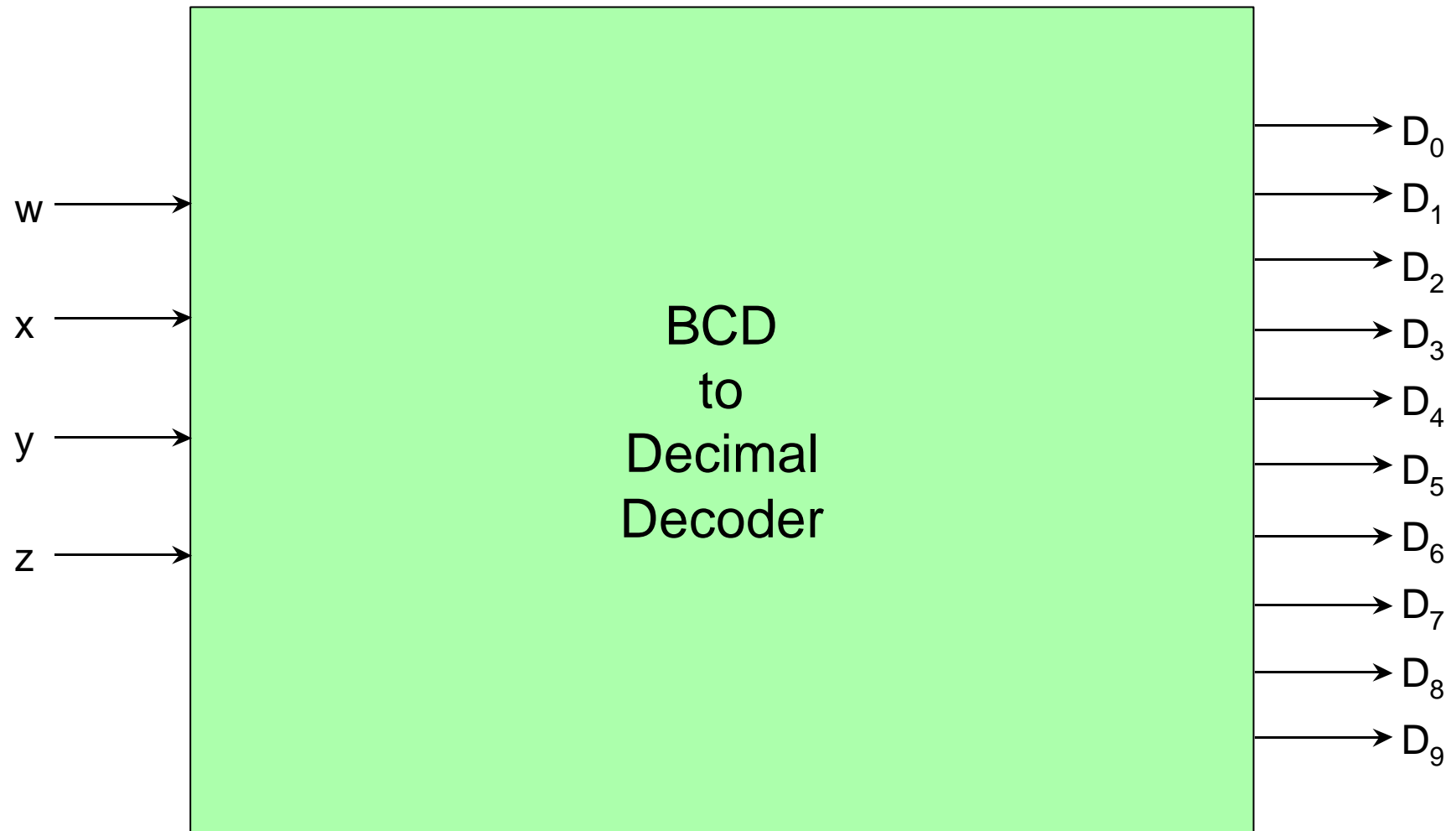
BCD to Decimal Decoder

w	x	y	z	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	D ₈	D ₉
0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	1	0	1	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	0	0	0
0	0	1	1	0	0	0	1	0	0	0	0	0	0
0	1	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	1	0	0	0	0
0	1	1	0	0	0	0	0	0	0	1	0	0	0
0	1	1	1	0	0	0	0	0	0	0	1	0	0
1	0	0	0	0	0	0	0	0	0	0	0	1	0
1	0	0	1	0	0	0	0	0	0	0	0	0	1

		yz			
		00	01	11	10
wx	00	D ₀	D ₁	D ₃	D ₂
	01	D ₄	D ₅	D ₇	D ₆
	11	X	X	X	X
	10	D ₈	D ₉	X	X

- D₀ = w' x' y' z'
- D₁ = w' x' y z'
- D₂ = x' y z'
- D₃ = x' y z
- D₄ = x y' z'
- D₅ = x y' z
- D₆ = x y z'
- D₇ = x y z
- D₈ = w z'
- D₉ = w z

BCD to Decimal Decoder

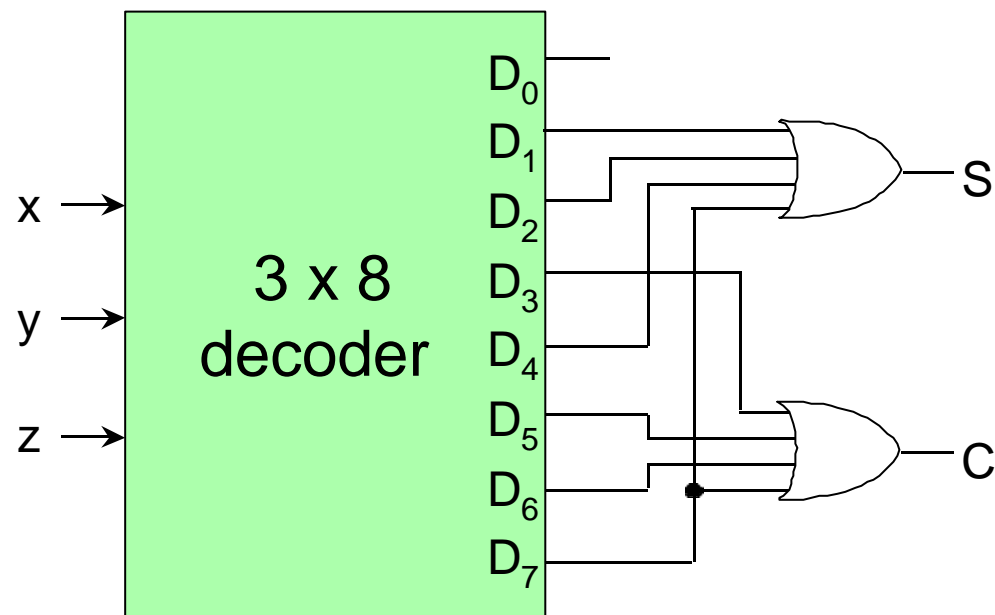


Decoder

- Combinational decoder

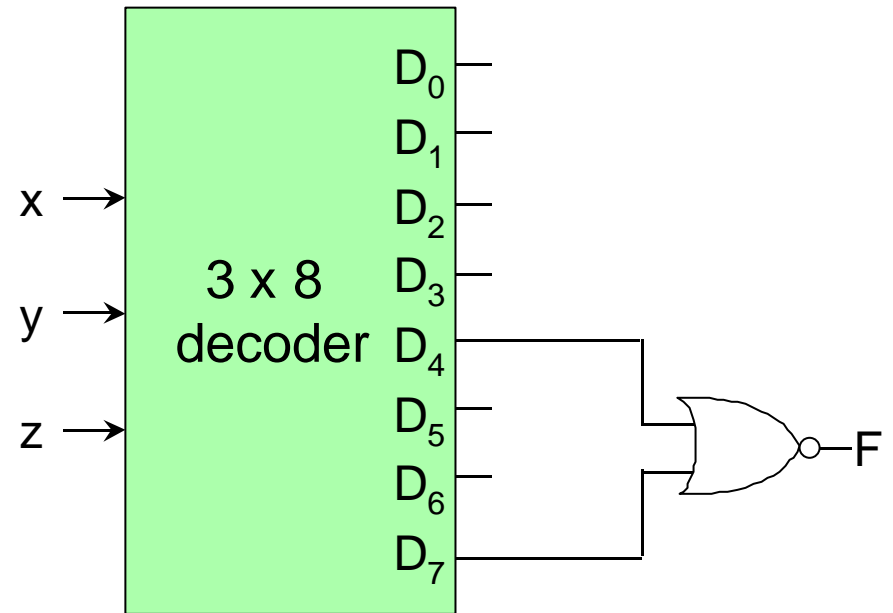
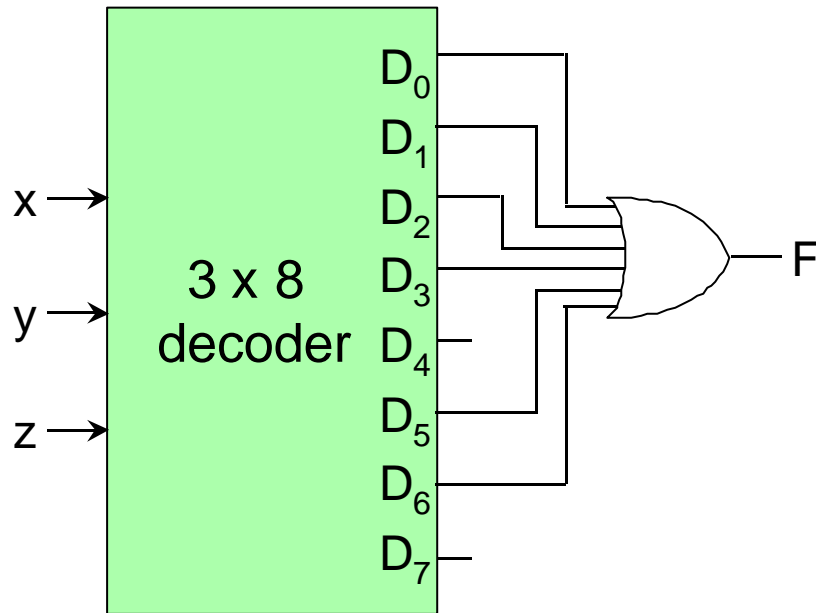
(ex) Full adder

$$S(x,y,z) = (1,2,4,7), C(x,y,z) = (3,5,6,7)$$



Decoder

- | | | | | | |
|-----|------------|-------------------|---|-----------------------|---------|
| | F가 k | minterm | | F (2 ⁿ -k) | minterm |
| | k | 2 ⁿ /2 | F | F가 | minterm |
| | | decoder | | NOR gate | |
| () | F(x,y,z) = | (0,1,2,3,5,6) | | F(x,y,z) = | (4,7) |



Decoder

- Decoder가 NAND gate

Decoder

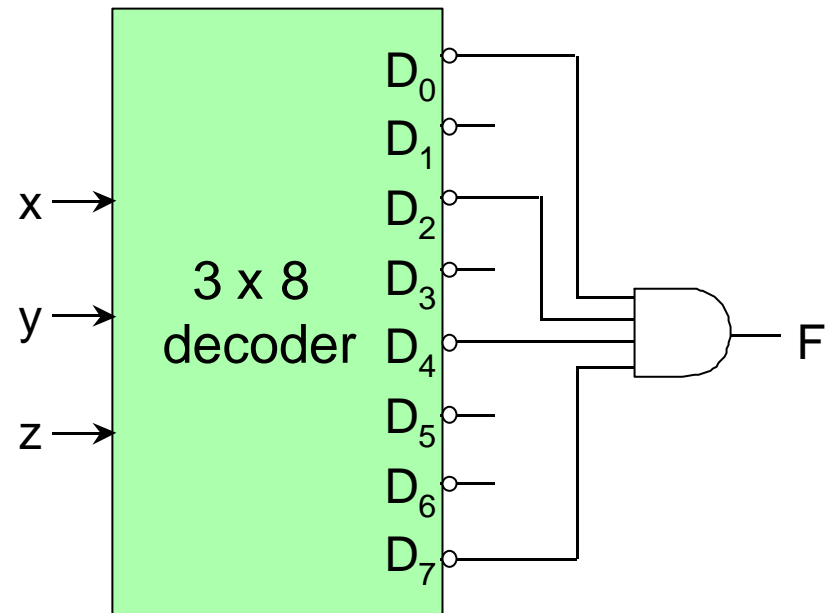
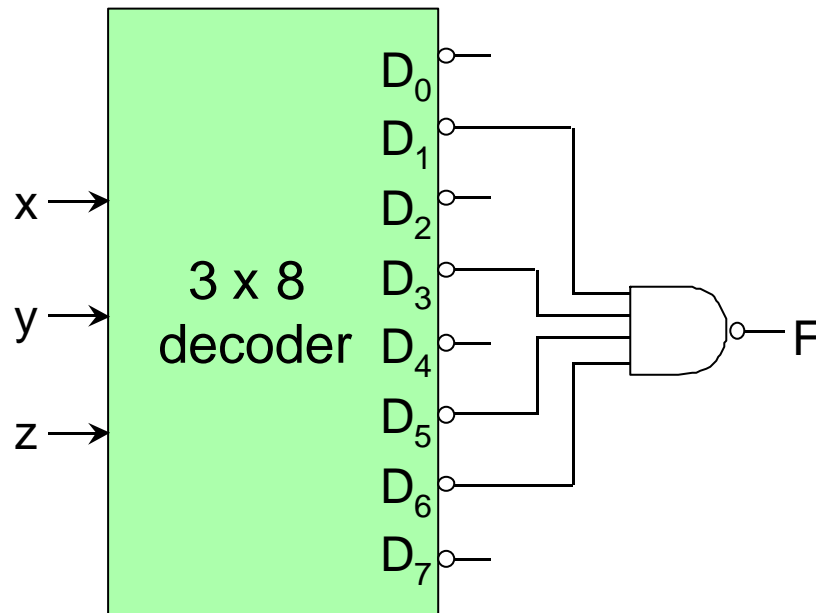
maxterm

minterm

maxterm

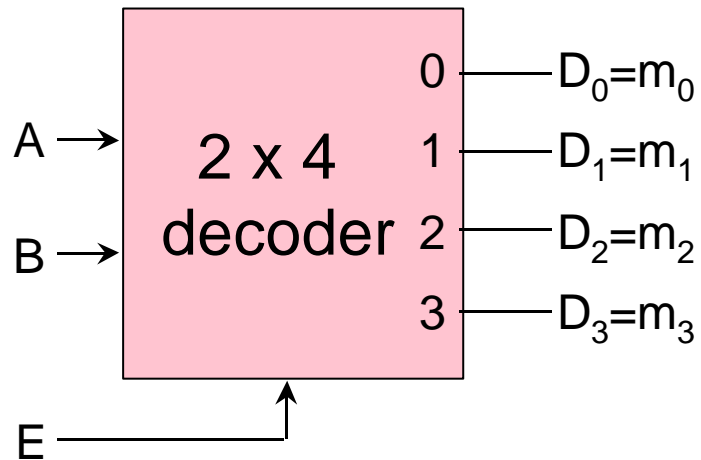
$$F(x,y,z) = (1,3,5,6) = \prod(0,2,4,7)$$

$$F(x,y,z) = (0,2,4,7) = \prod(1,3,5,6)$$



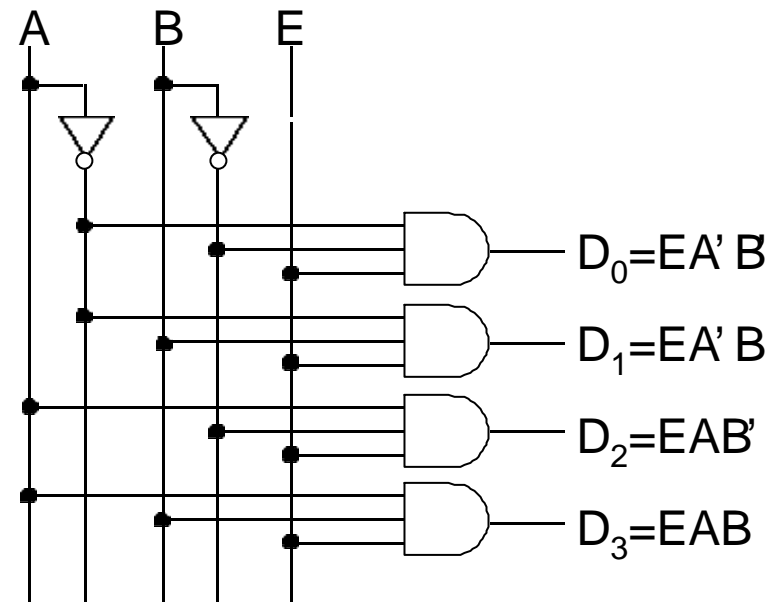
Decoder with Enable

- ❑ IC enable
- ❑ 2x4 decoder with enable



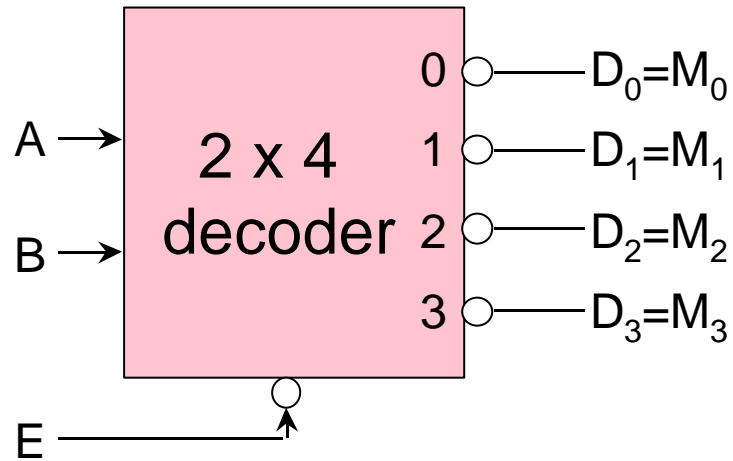
E	A	B	D ₀	D ₁	D ₂	D ₃
0	X	X	0	0	0	0
1	0	0	1	0	0	0
1	0	1	0	1	0	0
1	1	0	0	0	1	0
1	1	1	0	0	0	1

- ◆ E=0 : Decoder 0
- ◆ E=1 : Decoder



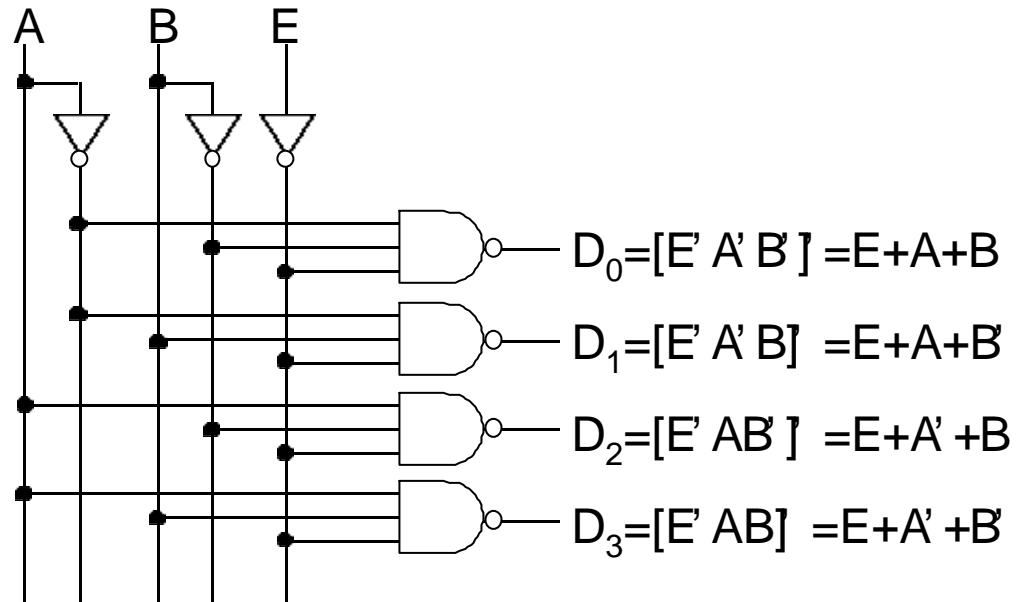
Decoder with Enable

- ❑ IC enable
- ❑ 2x4 decoder with enable



E	A	B	D ₀	D ₁	D ₂	D ₃
1	X	X	1	1	1	1
0	0	0	0	1	1	1
0	0	1	1	0	1	1
0	1	0	1	1	0	1
0	1	1	1	1	1	0

- ◆ E=1 : Decoder 1
- ◆ E=0 : Decoder



Encoder

❑ Decoder

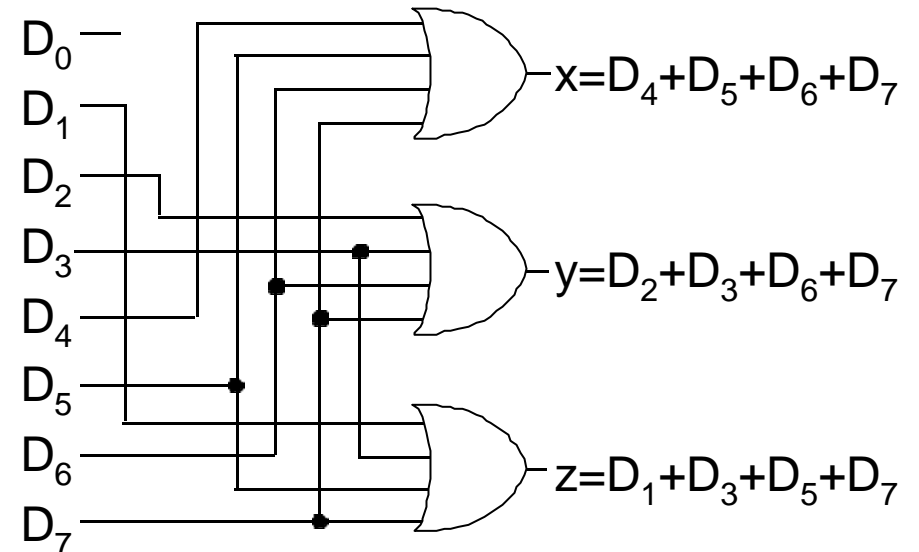
◆ 2^n () , n

◆ 가 2

❑ Octal to binary encoder

◆ 8 1 2

D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	x	y	z
1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	1	0	0	0	1	0	0
0	0	0	0	0	1	0	0	1	0	1
0	0	0	0	0	0	1	0	1	1	0
0	0	0	0	0	0	0	1	1	1	1



Priority Encoder

□ 2 가 encoder

□ 4-input priority encoder

D ₃	D ₂	D ₁	D ₀	A ₁	A ₀	V
0	0	0	0	X	X	0
0	0	0	1	0	0	1
0	0	1	X	0	1	1
0	1	X	X	1	0	1
1	X	X	X	1	1	1

- v : valid output (1 valid)
- priority : D₃ D₂ D₁ D₀

		D ₁ D ₀			
		00	01	11	10
D ₃ D ₂	00	X			
	01	1	1	1	1
	11	1	1	1	1
	10	1	1	1	1

$$A_1 = D_2 + D_3$$

		D ₁ D ₀			
		00	01	11	10
D ₃ D ₂	00	X		1	1
	01				
	11	1	1	1	1
	10	1	1	1	1

$$A_0 = D_3 + D_1 D_2'$$

		D ₁ D ₀			
		00	01	11	10
D ₃ D ₂	00		1	1	1
	01	1	1	1	1
	11	1	1	1	1
	10	1	1	1	1

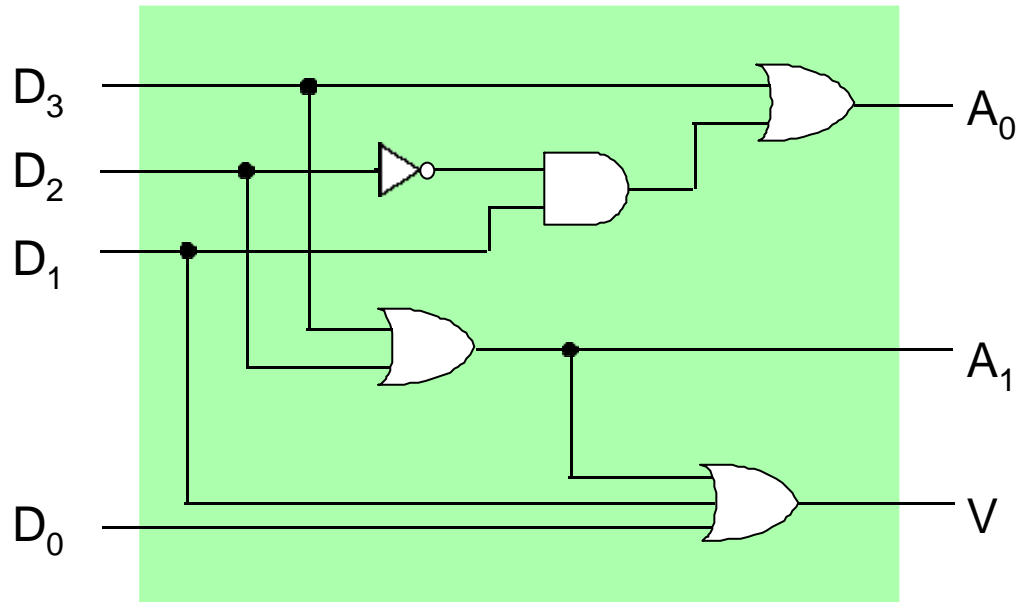
$$V = D_3 + D_2 + D_1 + D_0$$

4-bit Priority Encoder

$$A_1 = D_2 + D_3$$

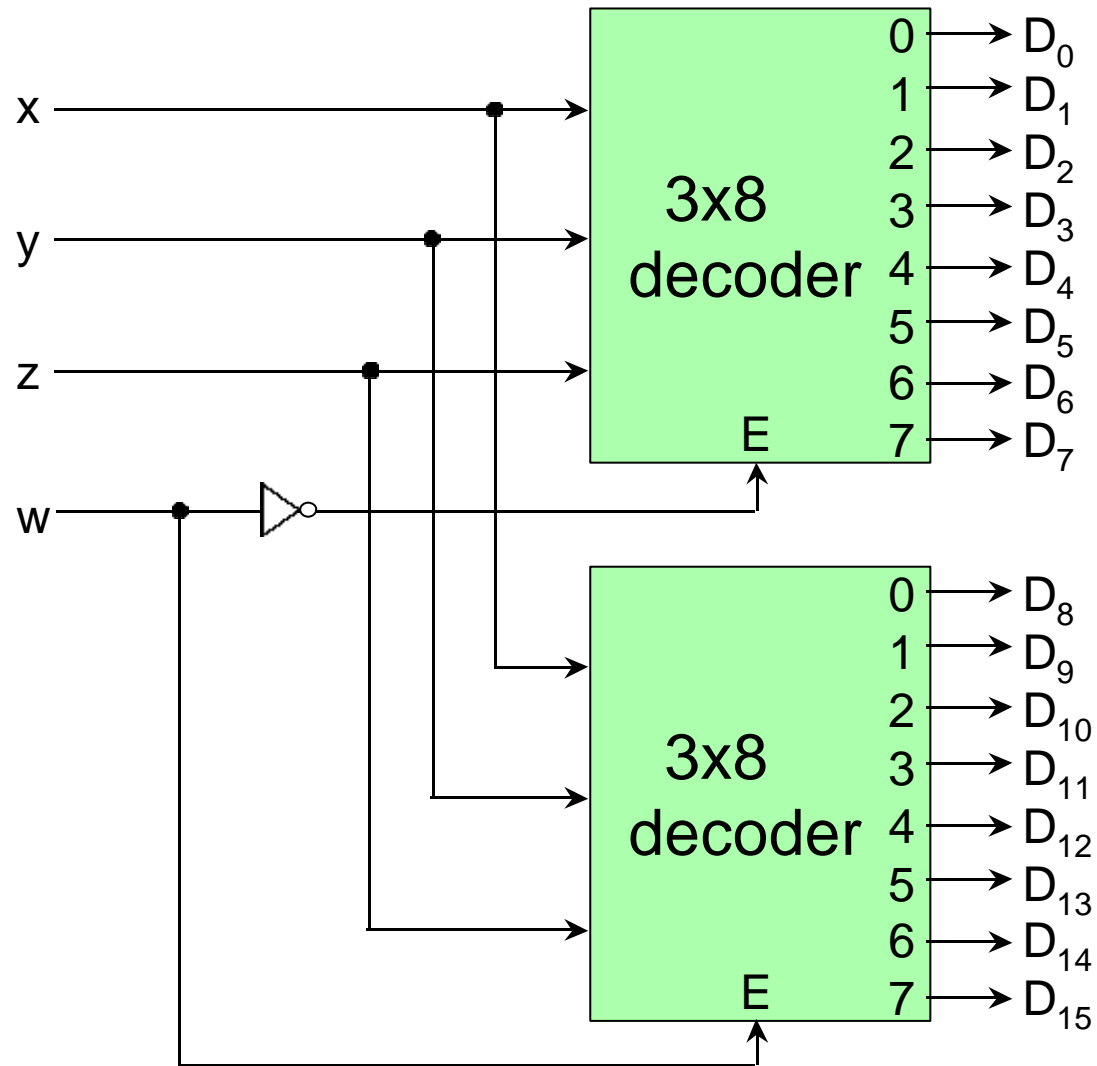
$$A_0 = D_3 + D_1 D_2'$$

$$V = D_3 + D_2 + D_1 + D_0$$



3x8 Decoder

4x16 Decoder



w=0
decoder가
D₀ ~ D₇ 가

w=1
decoder가
D₈ ~ D₁₅ 가