

①  $A = 425_{10}$

a)

	256	128	64	32	16	8	4	2	1
Binary	1	1	0	1	0	1	0	0	1

Octal	6			5			1		
-------	---	--	--	---	--	--	---	--	--

Hex.	11		01		01		00		1
	1		A		9				

BCD 010000100101<sub>1000</sub>

Gray's code 101111101.

b)  $B = 65_{10}$

$A - B = A + (-B)_{\text{two}}$

01000001<sub>two</sub>  $\rightarrow (-B)_{\text{two}} = 10111111$

sign bit.

10111110<sub>two</sub>

+ 1

sign bit 1 1 1 1 1 1 1

0110101001 (+425)

+ 1110111111 (-65)

bit extension.

discarded. 0101101000  $\rightarrow$  positive number. No overflow (+360)

c) sign = 0

mantissa = 01101000

exponent  $\rightarrow E - 127 = 8 \rightarrow E = 135 \rightarrow 10000111$

010000111, 0110100000...  
23 bits.

①

②

a)

$E_{in}$	T	H	Tox	$L_{red}$	$L_{yellow}$	$L_{green}$	$L_{red}$	$L_{yellow}$
0	0	0	0	0	0	1		
	0	0	1	1	0	0	Tox	
	0	1	0	0	1	0		
	0	1	1	1	0	0		
	1	0	0	0	1	0		
	1	0	1	1	0	0	Tox	$\overline{Tox}$
	1	1	0	0	1	0		
	1	1	1	1	0	0		
1	0	0	0	1	0	0		
	0	0	1	1	0	0		
	0	1	0	1	0	0		
	0	1	1	1	0	0		

b)  $L_{red}$

$E_{in} T$	$H Tox$	00	01	11	10
00		1	1		
01		1	1		
11		1	1	1	1
10		1	1	1	1

$Tox + E_{in} = L_{red}$

$E_{in} T$	$H Tox$	00	01	11	10
00					1
01		1			1
11					
10					

$\overline{E_{in}} H \overline{Tox} + \overline{E_{in}} T \overline{Tox} = L_{yellow}$

$$L_{green} = \overline{E_{in}} \cdot \overline{T} \cdot \overline{H} \cdot \overline{Tox}$$

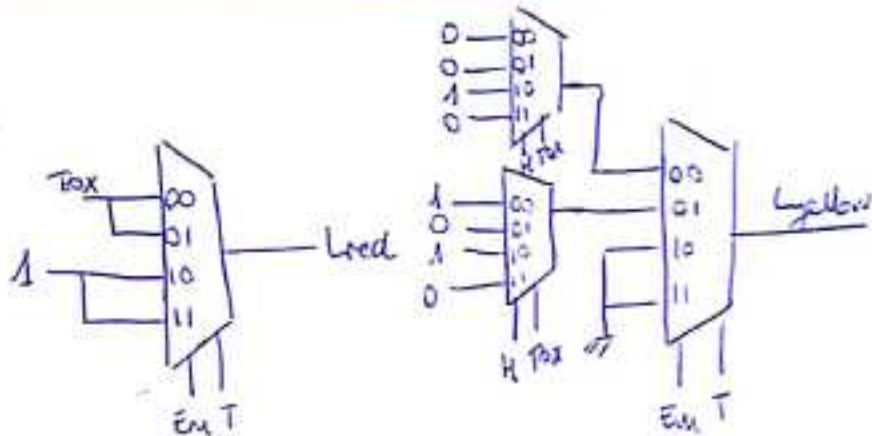
Or using minterms:

$$4 \leftarrow \overline{Tox} \cdot \overline{E_{in}} (H + T) = L_{yellow}$$

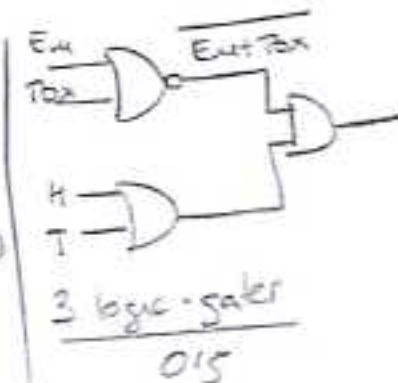
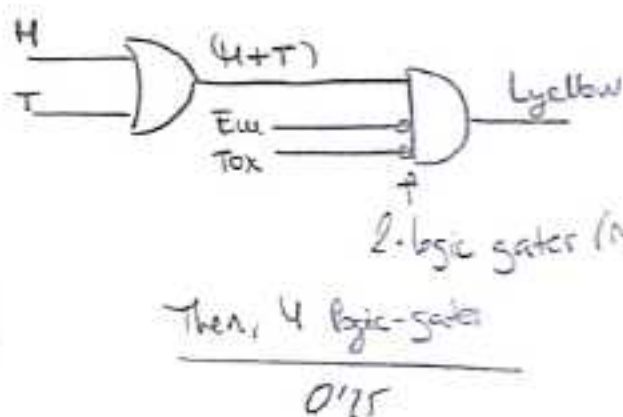
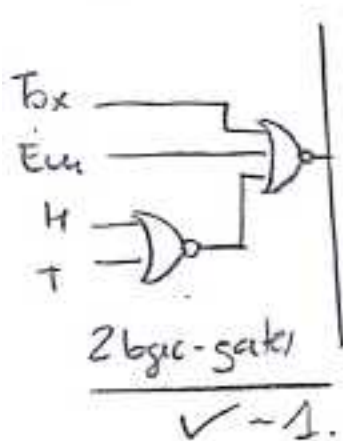
$$3 \leftarrow \overline{Tox} + \overline{E_{in}} (H + T) = L_y$$

$$NOR \cdot 2 \leftarrow \overline{Tox + E_{in} + (H + T)}$$

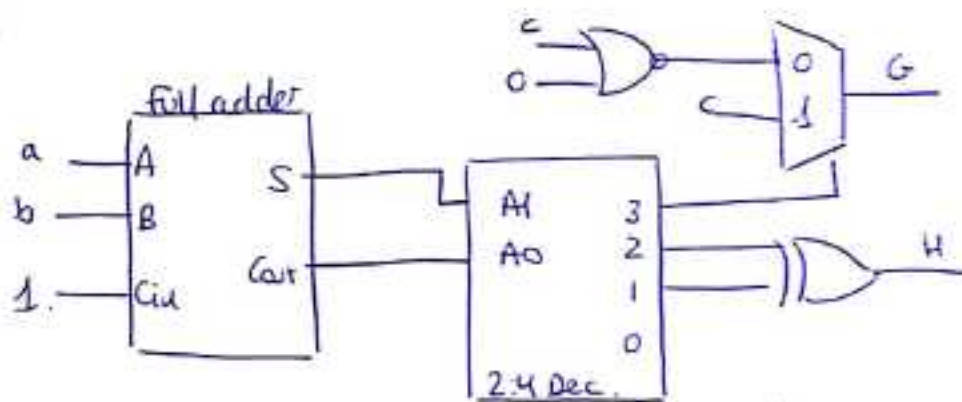
d)



c)  $\bar{E}_m H \bar{T}_{ox} + \bar{E}_m T \bar{T}_{ox} = \bar{E}_m \bar{T}_{ox} (H + T) = \bar{E}_m + \bar{T}_{ox} (H + T)$



③



a	b	c	G	H
0	0	0	1	1
0	0	1	0	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	1
1	0	1	0	1
1	1	0	0	0
1	1	1	1	0

a	b	Cin	S	Cout
0	0	1	1	0
0	1	1	0	1
1	0	1	0	1
1	1	1	1	1

→ Dec out 2

→ Dec out 1

→ Dec out 3

$G = c$

Rest of the cases

$G = \bar{c} + 0$  }  $c=0 \ G=1$   
 $G = c + 0$  }  $c=1 \ G=0$

Out 2	Out 1	H
0	0	0
0	1	1
1	0	1
1	1	0

→ when output 3 active

→ Not possible

②