1718. TC- First midterm exam

① $A = 425|_{10}$

a)

Binary

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

Octal $\underbrace{110}_{6}\ \underbrace{101}_{5}\ \underbrace{001}_{1}\ |_8$

Hex. $\underbrace{1}_{1}\ \underbrace{1010}_{A}\ \underbrace{1001}_{9}$

BCD $\underline{0100}\,\underline{0010}\,\underline{0101}|_{BCD}$

Gray's code 1 0 1 1 1 1 1 0 1.

b) $B = 65|_{10}$ $\qquad A - B = A + (-B)_{ca2}$

$\underbrace{0}_{\text{sign bit}}1000001|_{ca2} \longrightarrow (-B)_{ca2} = 10111111$

$$\begin{array}{r} 10111110|_{ca1} \\ +\qquad 1 \\ \hline \end{array}$$

sign bit 1 1 1 1 1 1 1

$$\begin{array}{rl} \boxed{0}110101001 & (+425) \\ + \underbrace{111}_{\text{bit extension}}0111111 & (-65) \\ \hline ①\,0\,1.\,0\,1\,1\,0\,1\,0\,0\,0 & \end{array}$$

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

c) sign = 0

mantissa = 0 1 1 0 1 0 0 0

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

$0\ 10000111\ \underbrace{0\,1\,1\,0\,1\,0\,0\,0\,0\,0 \ldots}_{23\text{ bits}}$

② a)

Em	T	H	Tox	Lred	Lyellow	Lgreen
0	0	0	0	0	0	1
	0	0	1	1	0	0
	0	1	0	0	1	0
	0	1	1	1	0	0
	1	0	0	0	1	0
	1	0	1	1	0	0
	1	1	0	0	1	0
	1	1	1	1	0	0
1	0	0	0	1	0	0
	⋮	⋮	⋮	⋮	⋮	⋮
	1	1	1	1	0	0

Lred — Lyellow

Tox

Tox — $\overline{Tox}$

b) Lred

EmT \ HTox	00	01	11	10
00		1	1	
01		1	1	
11	1	1	1	1
10	1	1	1	1

$$\boxed{Tox + Em = L_{red}}$$

Lyellow

EmT \ HTox	00	01	11	10
00				1
01	1			1
11				
10				

$$\boxed{\overline{Em}\,H\,\overline{Tox} + \overline{Em}\,T\,\overline{Tox} = L_{yellow}}$$

$$\boxed{L_{green} = \overline{Em}\cdot\overline{T}\cdot\overline{H}\cdot\overline{Tox}}$$

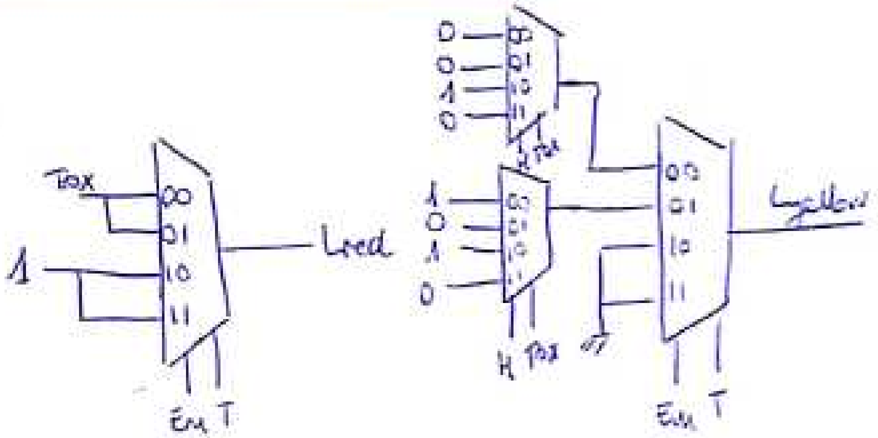
Or using minterms:

$$4 \leftarrow \boxed{\overline{Tox}\cdot\overline{Em}\,(H+T) = L_{yellow}}$$

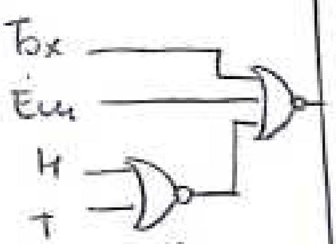
$$3 \leftarrow \overline{Tox + Em}\,(H+T) = L_y.$$

$$\text{NOR}\cdot 2 \leftarrow \overline{Tox + Em + \overline{(H+T)}}$$

d)

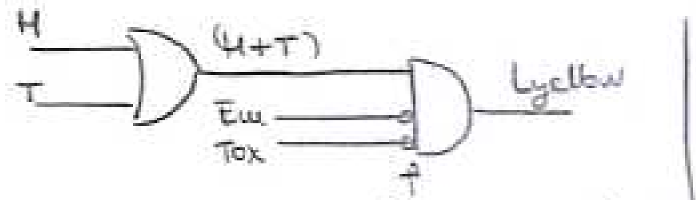


c) $\overline{Em}\,H\,\overline{Tox} + \overline{Em}\,T\,\overline{Tox} = \overline{Em}\,\overline{Tox}\,(H+T) = \overline{Em+Tox}\,(H+T)$



2 logic-gates

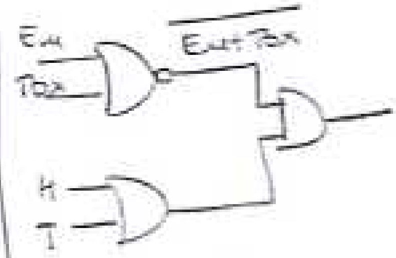
✓ -1.



2 logic gates (NOT)

Then, 4 logic-gates

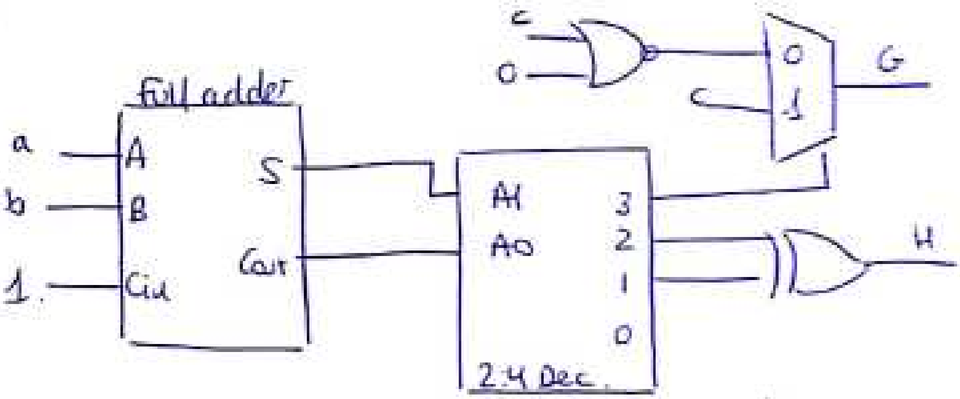
0'25



3 logic-gates

0'5

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	→ Dec out 2
0	1	1	0	1	} → Dec out 1
1	0	1	0	1	
1	1	1	1	1	{ → Dec out3 → $\boxed{G = c}$

Rest of the cases $\left\{ G = \overline{c+0} \right.$ $\left\{ \begin{array}{l} c=0\ G= \\ c=1\ G=0 \end{array} \right.$

Out 2	Out 1	H	
0	0	0	→ when output 3 active
0	1	1	
1	0	1	
1	1	0	→ Not possible

②