Question 1

	x_4	x_3	x_2	x_1	f
0	0	0	0	0	0
1	0	0	0	1	0
2	0	0	1	0	0
3	0	0	1	1	0
4	0	1	0	0	0
5	0	1	0	1	0
6	0	1	1	0	0
7	0	1	1	1	1
8	1	0	0	0	0
9	1	0	0	1	0
10	1	0	1	0	0
11	1	0	1	1	1
12	1	1	0	0	0
13	1	1	0	1	1
14	1	1	1	0	1
15	1	1	1	1	1

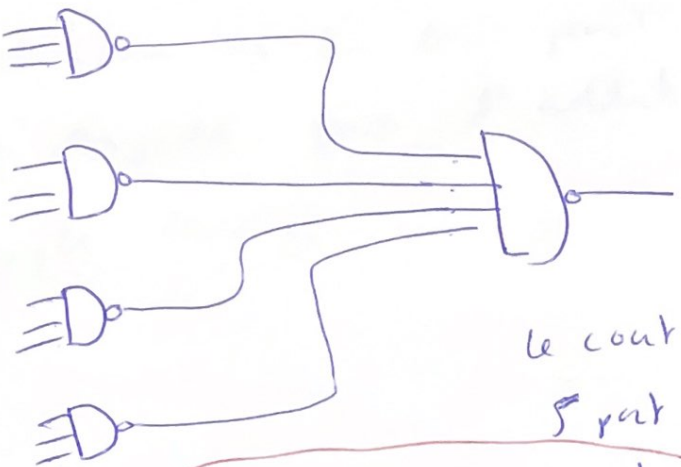
x_1x_2 \ x_4x_3	00	01	11	10
00				
01			1	
11		1	1	1
10			1	

$$f = x_1x_2x_3 + x_2x_3x_4 + x_1x_4x_3 + x_1x_2x_4$$

$$f = x_1x_2(x_3 + x_4) + x_3x_4(x_1 + x_2)$$

$$f = \overline{\overline{f}} = \overline{\overline{x_1x_2x_3 + x_2x_3x_4 + x_1x_3x_4 + x_1x_2x_4}}$$

$$f = \overline{x_1x_2x_3} \cdot \overline{x_2x_3x_4} \cdot \overline{x_1x_3x_4} \cdot \overline{x_1x_2x_4}$$



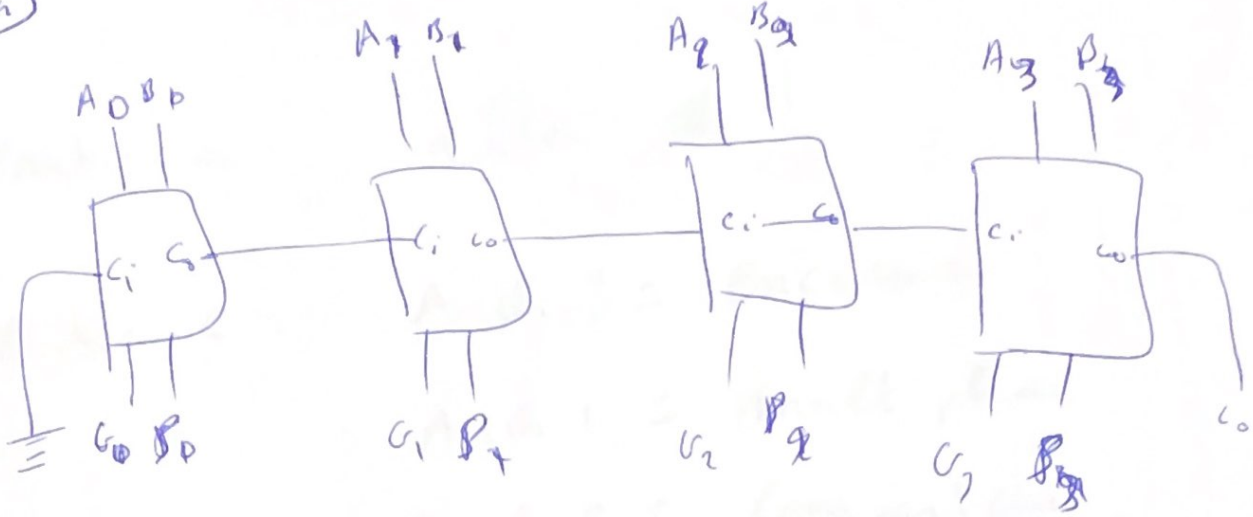
le cout est:

5 port NAND + 16

le cout total = 21

Question 2

Partie a)



C_i : Cin

C_o : Cout

Partie b)

~~Ça sera plus rapide que l'additionneur~~

~~Ça~~

L'additionneur carry look ahead est plus rapide que l'additionneur ripple carry.

Question III

Partie a: alter # 1

Partie c: Arch 3 = encodeur

Arch 1 = multiplexeur

Arch 9 = Comparateur.

entity example is
port (a, b, c : In STD_logic;
qn : out STD_logic);
end example.

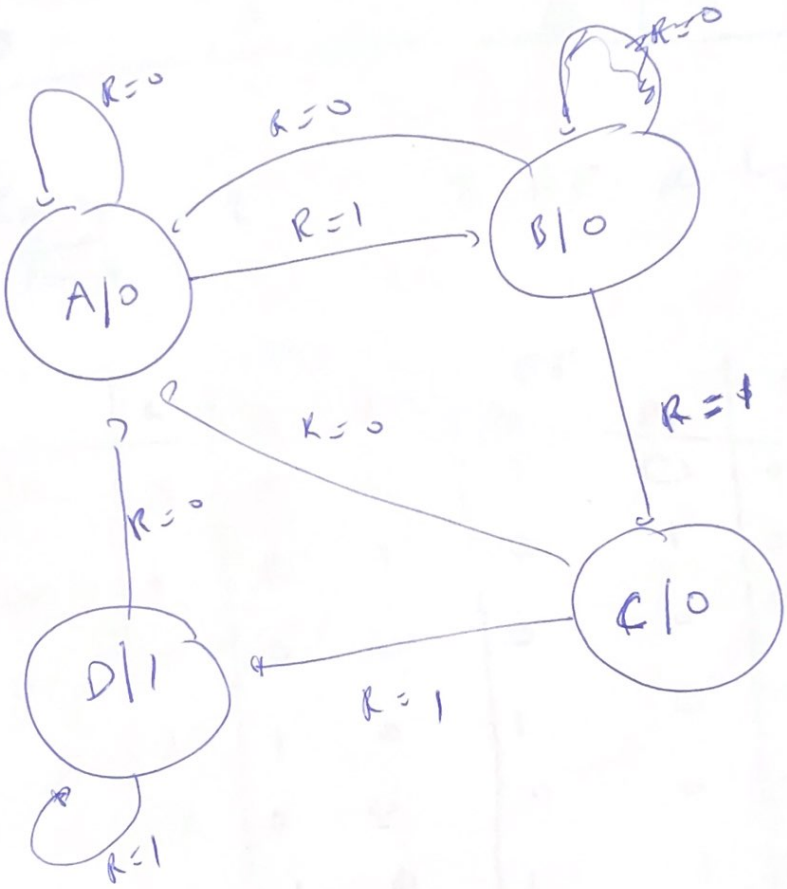
Question 4

A =

B =

C =

D =



P.S N.S output

	$R=0$	$R=1$	z
A	A	B	0
B	A	C	0
C	A	D	0
D	A	D	1

$n = \frac{\log 4}{\log 2} = 2$ 2 F.F. of type D

P.S y_2	P.S y_1	x	N.S Y_2	N.S Y_1	FF D_2	FF D_1	z
0	0	0	0	0	0	0	0
0	0	1	0	1	0	1	0
0	1	0	0	0	0	0	0
0	1	1	1	0	1	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	1	1	0
1	1	0	0	0	0	0	1
1	1	1	1	1	1	1	1

D_2

R \ y_2y_1	00	01	11	10
0			(1)	
1		(1)		(1)

$$D_2 = y_2 y_1 \bar{R} + R(\bar{y}_2 y_1 + y_2 \bar{y}_1)$$

$$D_2 = y_2 y_1 \bar{R} + (y_2 \oplus y_1) R.$$

D_1

R \ y_2y_1	00	01	11	10
0				(1)
1	(1)		(1)	

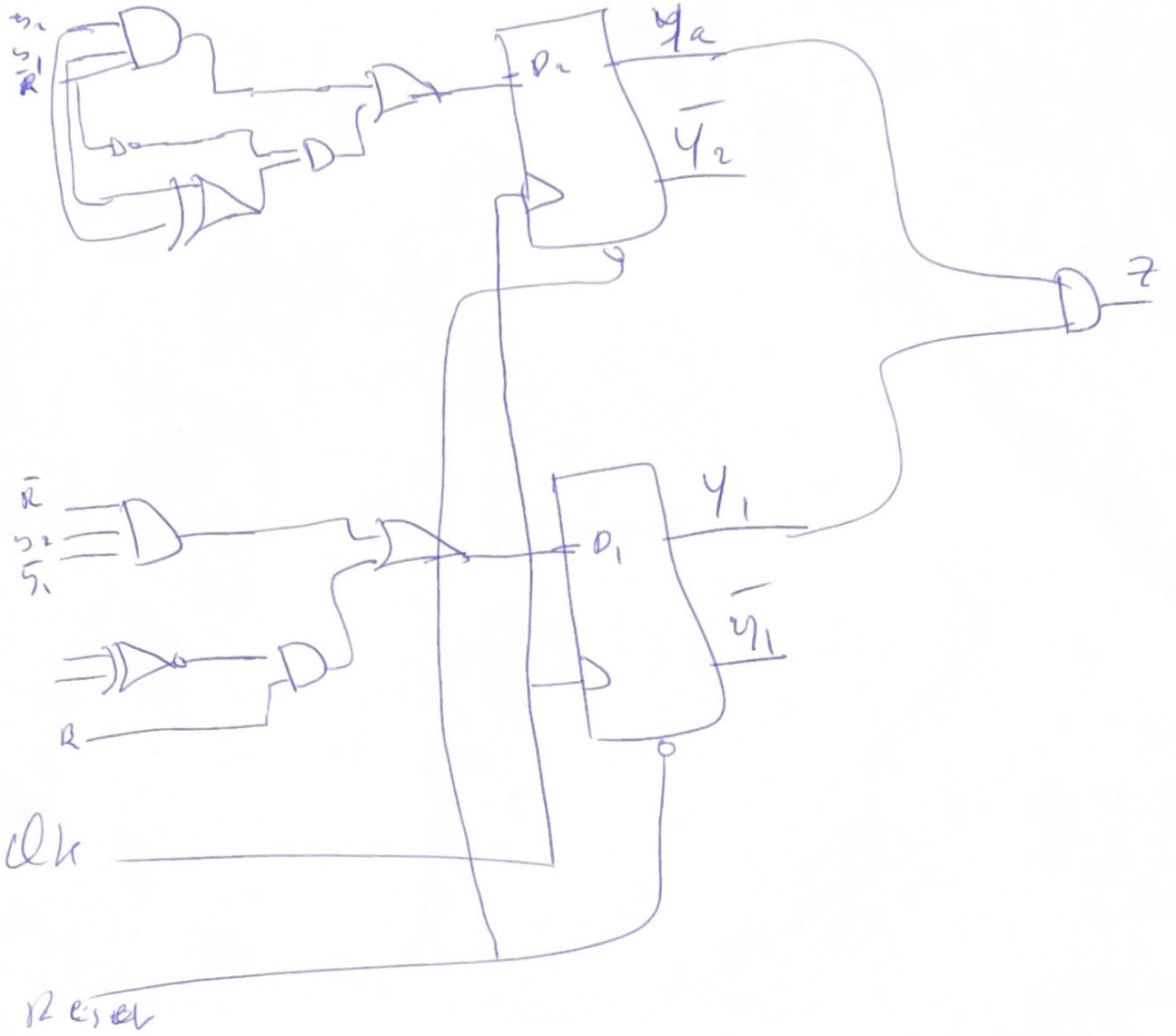
$$D_1 = \bar{R}(y_2 \bar{y}_1) + R(\bar{y}_2 \bar{y}_1 + y_2 y_1)$$

$$= \bar{R} y_2 \bar{y}_1 + R(y_2 \odot y_1)$$

z

R \ y_2y_1	00	01	11	10
0			1	
1			1	

$$z = y_2 y_1$$


y_2
y_1
$\bar{R}$
D_2
Y_2
$\bar{Y}_2$
Z
$\bar{R}$
y_2
$\bar{y}_1$
D_1
Y_1
$\bar{Y}_1$
R
Clk
Reset