Homework # 4

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Q.1 →

AB \ CD	00	01	11	10
00		1		
01	1	1	1	1
11		1	1	1
10		1	1	1

A'B

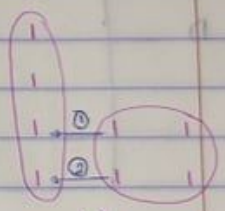
CD'

AC

(1). Determine the values of input at wich hazard may occer

A) ① A B C D
1 1 1 1 → C → changed
1 1 0 1

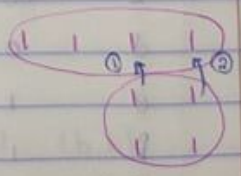
② A B C D
1 0 1 1 → C → changed
1 0 0 1



(A)

B) ① A B C D
1 1 1 1 → A changed
0 1 1 1

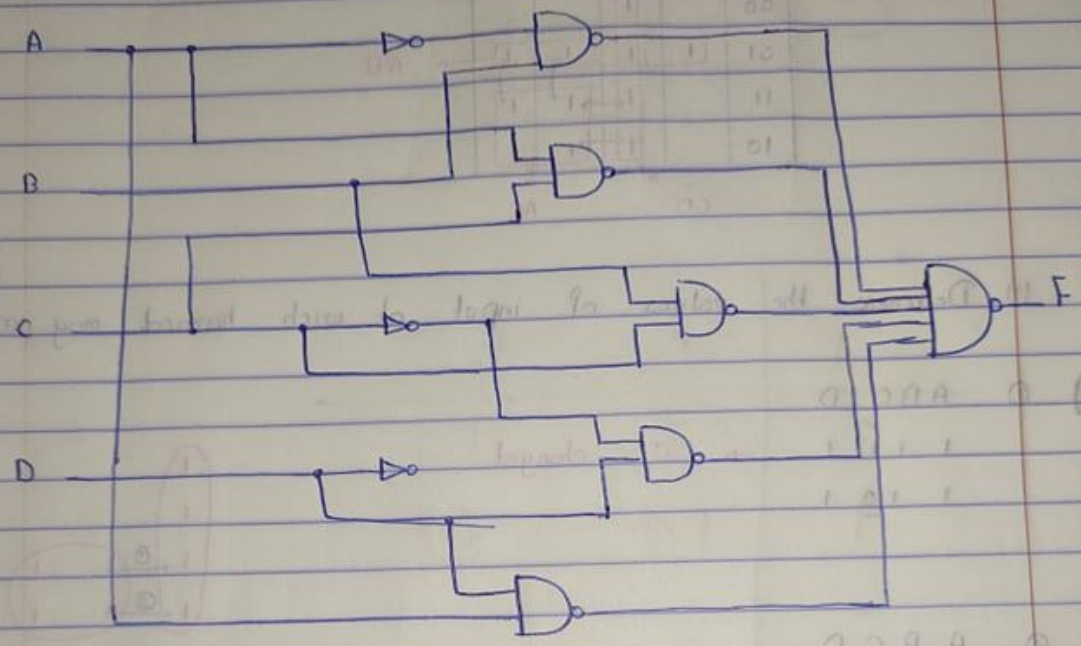
② A B C D
1 1 1 0 → A changed
0 1 1 0



(B)

(2) Draw the hazard from circuit (NAND-NAND)

$F = A'B + AC + C'D + AD + BC$



Q2.

	D	C	Q	Stability	After
a	0	0	0	Yes	d,e,c
b	0	0	1	Yes	f
c	0	1	0	Yes	a,g
d	0	1	1	Yes	b,h
e	1	0	0	Yes	a
f	1	0	1	Yes	b,g,h
g	1	1	0	Yes	c,e
h	1	1	1	Yes	d,f

* Premative tables :

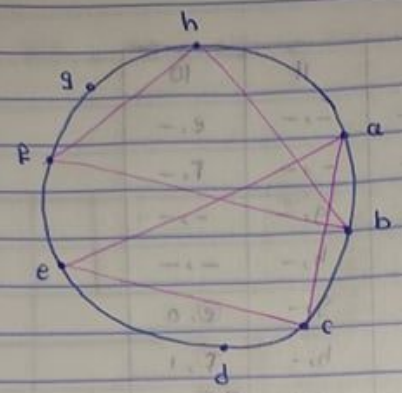
a	00	01	11	10
a	(a), 0	c, -	-, -	e, -
b	(b), 1	d, -	-, -	f, -
c	a, -	(c) 0	g, -	-, -
d	a, -	(d) 1	h, -	-, -
e	a, -	-, -	g, -	(e), 0
f	b, -	-, -	h, -	(f), 1
g	-, -	c, -	g, 0	f, -
h	-, -	d, -	h, 1	f, -

* Implication chart

	a	b	c	d	e	f	g
b	X						
c	✓	X					
d	X	X	X				
e	✓	X	✓	X			
f	X	✓	X	X	X		
g	X	X	✓	X	X	X	
h	X	✓	X	✓	X	✓	X

⇒ Compatable pairs are : (a,c), (a,e), (b,f), (b,h)
(c,e), (c,g), (d,h), (f,h)

* Diagram :



1). (a, c, e) → a
2). (b, f, h) → b
3). (c, g) → c
4). (d, h) → d

→

	00	01	11	10
a	a,0	c,0	g,-	e,0
b	a,-	d,1	h,-	-,-
c	b,1	d,-	h,1	f,1
d	-,-	c,-	g,0	f,-

⇓

	00	01	11	10
a	(a),0	(a),0	d,-	(a),0
b	a,-	(b),1	c,-	-,-
c	c,1	b,-	(c),1	(c),1
d	-,-	a,-	(d),0	c,-

∴ we have 4 states ⇔ we need 2 state variables

State Assigment : a . 00
b . 01
c . 11
d . 10

* Output

DC / y_1y_2	00	01	11	10
00	0	0	X	0
01	X	1	X	X
11	1	X	1	1
10	X	X	0	X

Q = Y_2

=>

DC

DC / y_1y_2	00	01	11	10
00	0	0	1	0
01	0	0	1	X
11	1	0	1	1
10	X	0	1	1

$y_1 = DC + y_1C'$

* Input

DC / y_1y_2	00	01	11	10
00	00	00	10	00
01	00	01	11	XX
11	11	01	11	11
10	XX	00	10	11

y_1 y_2

DC

DC / y_1y_2	00	01	11	10
00	0	0	0	0
01	0	1	1	X
11	1	1	1	1
10	X	0	0	1

$y_2 = y_1C' + y_2C$

* Excitation Table For SR latches

y	x	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

(1).

	00	01	11	10
00	0	0	1	0
01	0	0	1	X
11	X	0	X	X
10	X	0	X	X

$S_1 = DC$

(3).

	00	01	11	10
00	X	X	0	X
01	X	X	0	X
11	0	1	0	0
10	X	1	0	0

$R_1 = D'C$

(2).

	00	01	11	10
00	0	0	0	0
01	0	X	X	X
11	X	X	X	X
10	X	0	0	1

$S_2 = y_1C'$

(4).

	00	01	11	10
00	X	X	X	X
01	1	0	0	X
11	0	0	0	0
10	X	X	X	0

$R_2 = y_1'C'$

** Circuit using SR- latch: