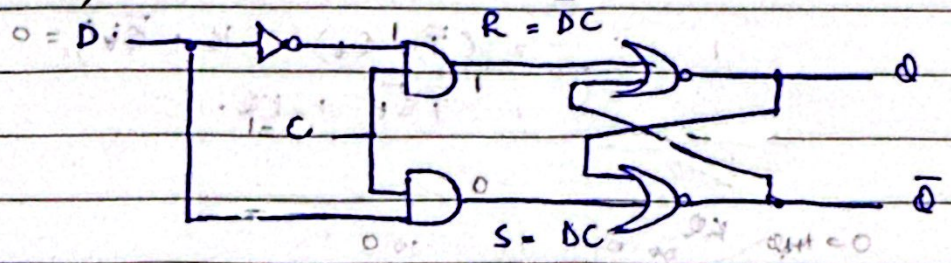
Sarita Sangree

23i - 2088

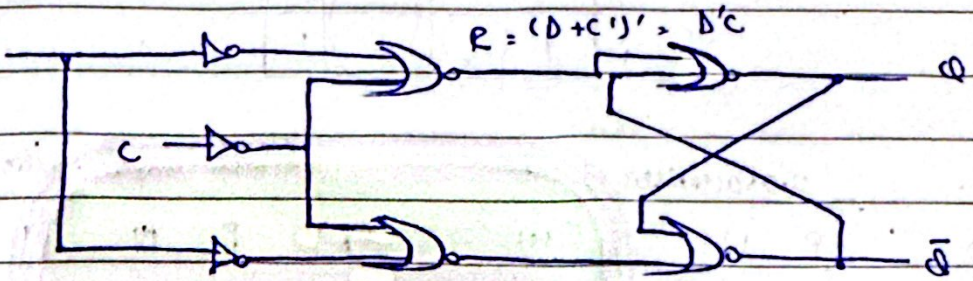
Date: CU-A

Assignment 05

5.1. a)

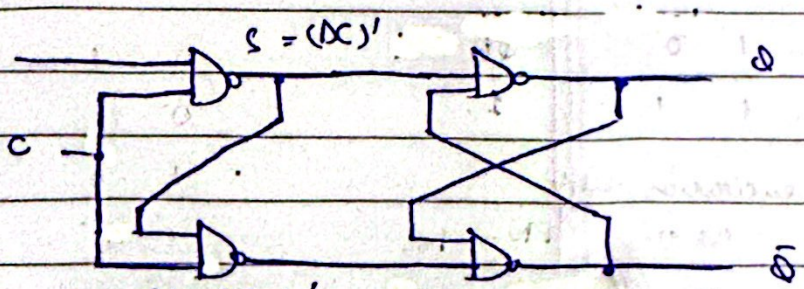


b)



S = (D'+C')' = DC

c)

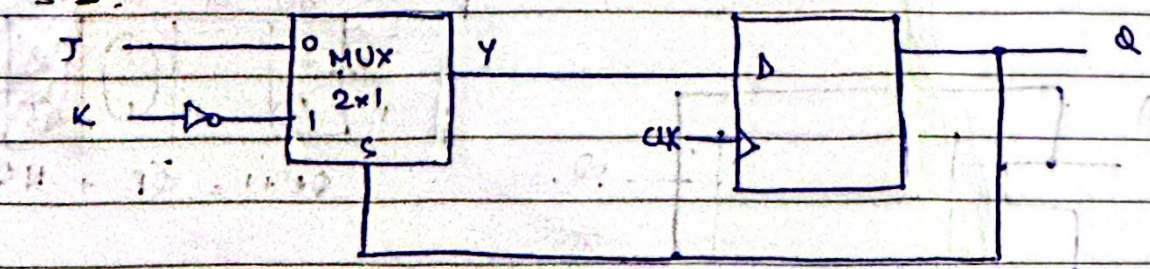


$\overline{A.B} = \bar{A} + \bar{B}$

R = ((DC)'C)'

= DC + C' = (D+C') = (D'C)'

5.2.



D = $J\bar{Q} + \bar{K}Q$.

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5.3. Equation of JK FF: $Q_{t+1} = \bar{Q}_t J + Q_t \bar{K}$

$$\overline{Q_{t+1}} = (J\bar{Q}_t + \bar{K}Q_t)' = \overline{(J\bar{Q}_t)} \cdot \overline{(\bar{K}Q_t)}$$

$\overline{A+B} \Rightarrow \bar{A} \cdot \bar{B}$

$$= (\bar{J} + Q_t) \cdot (K + \bar{Q}_t)$$

$$= \bar{J}\bar{Q}_t + KQ.$$

J \ KQ	00	01	11	10
P: 0	0	1	0	0
1	1	1	0	1

5.4. characteristic table — characteristic equation.

a)

P	N	Q_{t+1}
0	0	0
0	1	Q_t
1	0	$\bar{Q}_t$
1	1	1

b)

P	N	Q_t	Q_{t+1}
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

excitation table

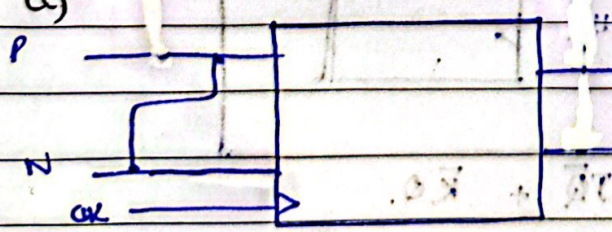
c)

Q_t	Q_{t+1}	P	N
0	0	0	x
0	1	1	x
1	0	x	0
1	1	x	1

P \ NQ	00	01	11	10
0	0	0	1	0
1	1	1	1	1

$Q_{t+1} = \bar{Q}P + NQ.$

d)



connect P and N together.

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5.5. 1) Truth table describes the combinational circuit.

2) The state table describes a sequential circuit

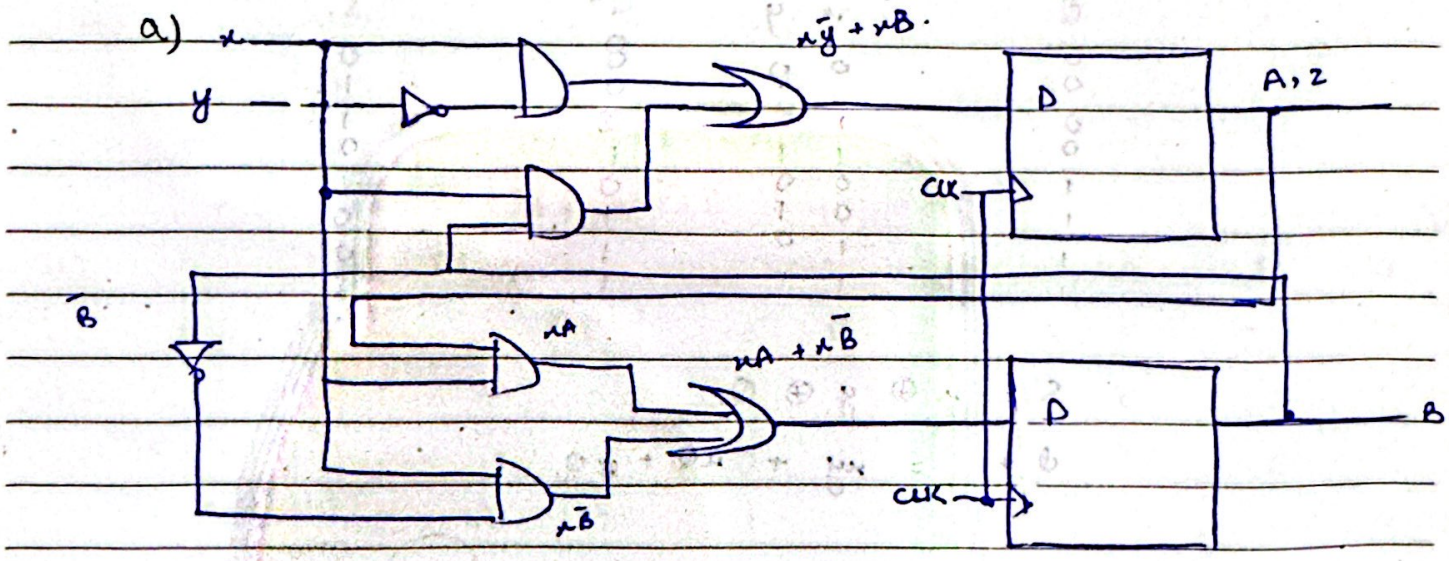
3) The characteristic table describes the operation of flip-flop.

4) Excitation table gives values of Flip Flop inputs for a given state transition.

5) The 4 equations correspond to the algebric expression of the 4 tables.

5.6.

a)



b) $A_{t+1} = x\bar{y} + xB$

$B_{t+1} = xA + x\bar{B}$

$z = A$

Present A	Present B	Next A^+	Next B^+	x	y	z
0	0	0	0	0	0	0
0	0	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	1	1	1	0
0	1	0	0	0	0	0
0	1	0	0	0	1	0
0	1	1	0	1	0	0
0	1	1	0	1	1	0
1	0	0	0	0	0	1
1	0	0	0	0	1	1
1	0	1	1	1	0	1
1	0	1	1	1	1	1
1	1	0	0	0	0	1
1	1	0	0	0	1	1
1	1	1	1	1	0	1
1	1	1	1	1	1	1

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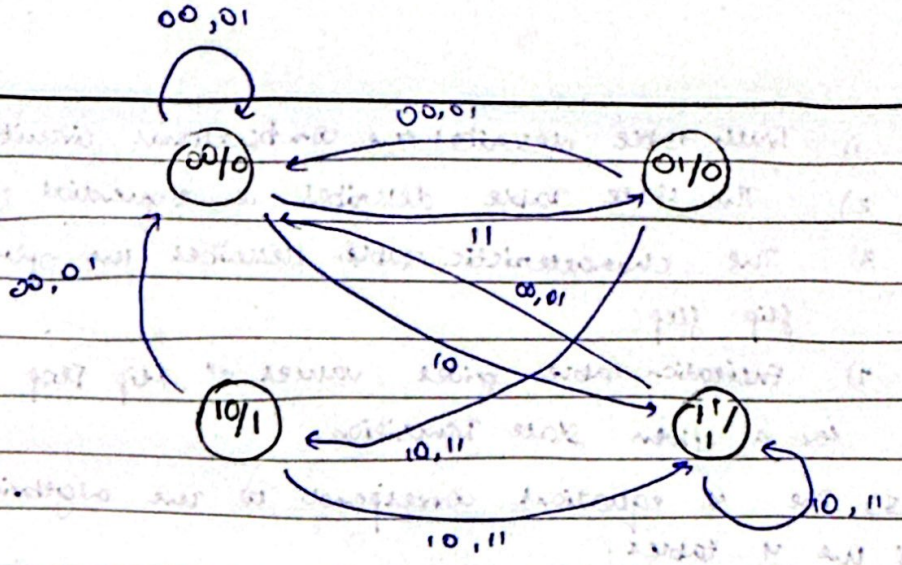
c)

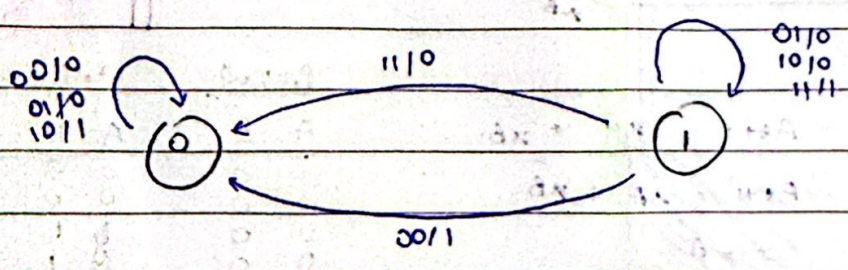


5.7.

Present	inputs		Next	output
Q	x	y	Q+	S.
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

$S = x \oplus y \oplus Q$.

$Q_{t+1} = xy + xQ + yQ$.



5.8

	Present		Next		FF inputs.	
	A	B	A+	B+	TA	TB
TA = A + B	0	0	0	1	0	1
TB = $\bar{A}$ + B.	0	1	1	0	1	1
	1	0	0	0	1	0
	1	1	0	0	1	1

↳ look at T_B

TA

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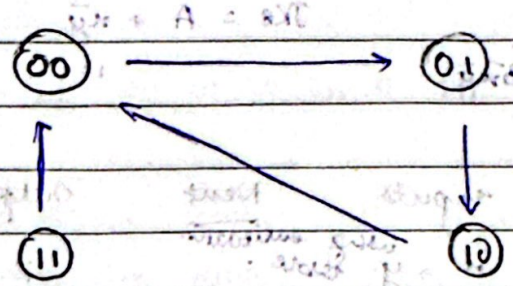
$T_A = A + B.$

$T_B = A + B.$



5.9. $J_A = x \quad K_A = B$

$J_B = x \quad K_B = \bar{A}$

a) $Q_{t+1} = J\bar{Q}_t + \bar{K}Q_t.$

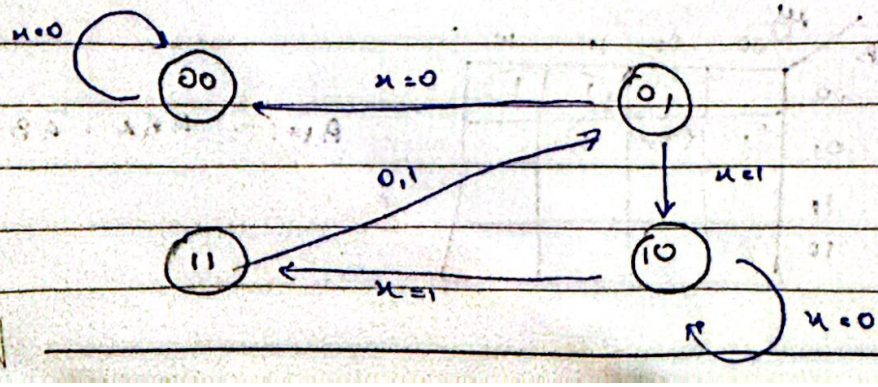
$A_{t+1} = J_A\bar{A}_t + \bar{K}_A A_t$

$\rightarrow A_{t+1} = x\bar{A}_t + \bar{B}A_t.$

$\rightarrow B_{t+1} = J_B\bar{B} + \bar{K}_B B = x\bar{B} + AB.$

b)

Q	Q_{t+1}	J	K	x	A	B	A^+	B^+	J_A	K_A	J_B	K_B
0	0	0	x	0	0	0	0	0	0	0	0	1
0	1	1	x	0	0	1	0	0	0	1	0	1
1	0	0	x	0	1	0	1	0	0	0	0	0
1	1	x	0	0	1	1	1	0	0	0	0	0
				1	0	0	1	0	1	0	1	1
				1	0	1	1	0	1	1	1	1
				1	1	0	1	1	1	0	1	0
				1	1	1	0	1	1	1	1	0



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Q	Q_{t+1}	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

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5.10.

a) $J_A = Bx + \bar{B}\bar{y}$ $\quad K_A = \bar{B}x\bar{y}$

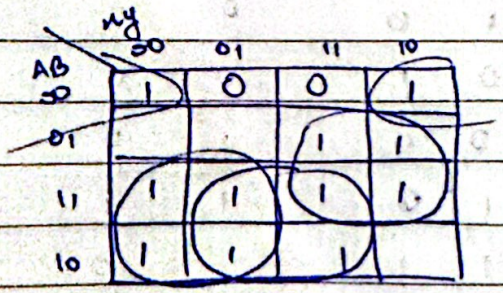
$J_B = \bar{A}x$ $\quad K_B = A + x\bar{y}$

$z = A\bar{x}\bar{y} + B\bar{x}\bar{y}$

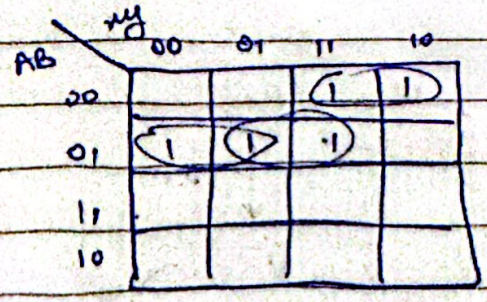
b) using excitation table.

Present A	Present B	Input x	Input y	Next A^+	Next B^+	output z	FF inputs J_A	K_A	J_B	K_B
0	0	0	0	0	0	0	0	x	0	x
0	0	0	1	0	0	0	0	x	0	x
0	0	1	0	0	1	0	0	x	1	x
0	0	1	1	0	0	0	0	x	0	x
0	1	0	0	0	1	1	0	x	x	0
0	1	0	1	0	0	0	0	x	x	1
0	1	1	0	1	0	0	1	x	x	1
0	1	1	1	0	0	0	0	x	x	1
1	0	0	0	1	0	0	x	0	0	x
1	0	0	1	1	0	0	x	0	0	x
1	0	1	0	0	0	0	x	1	0	x
1	0	1	1	0	0	0	x	1	0	x
1	1	0	0	1	0	0	x	0	0	x
1	1	0	1	1	0	0	x	0	0	x
1	1	1	0	1	0	1	x	0	0	x
1	1	1	1	1	0	0	x	0	0	x

c)



$A_{x+1} = A\bar{x} + Bx + Ay + \bar{A}B\bar{y}$



$B_{x+1} = \bar{A}\bar{B}x + \bar{A}\bar{B}(\bar{x}+y)$.

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5.11.

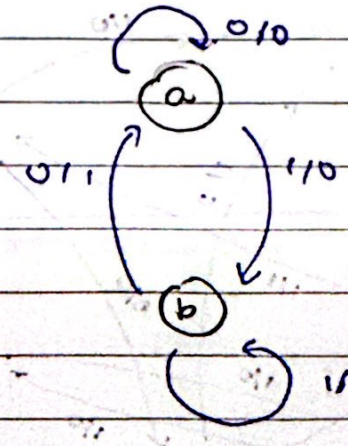
a)

Present:	00	00	01	00	01	11	00	01	11	10	00	01	11	10	10
Input:	0	1	0	1	1	0	1	1	1	0	1	1	1	1	0
Output:	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1
Next:	00	01	00	01	11	00	01	11	10	00	01	11	10	10	00

b). State labels : a : 00 , b : 10 , c : 11 , d : 01

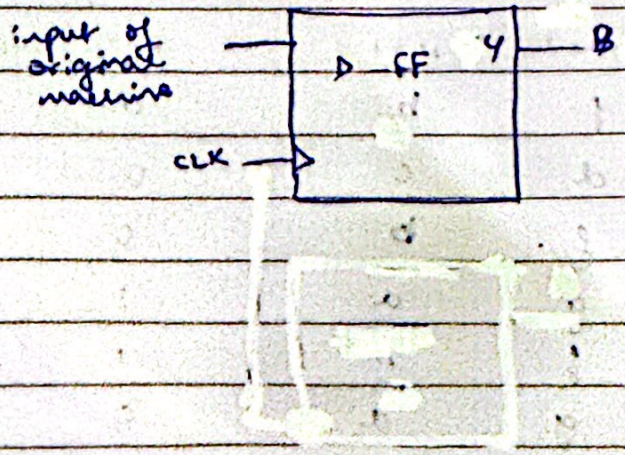
c is equal to b.

d is equal to c.



c)

input	state	next	output
0	0	0	0
0	1	1	0
1	0	0	0
1	1	1	1



- Direct input of input to original machine
- output : Y = (not equal to input)
- state : B.

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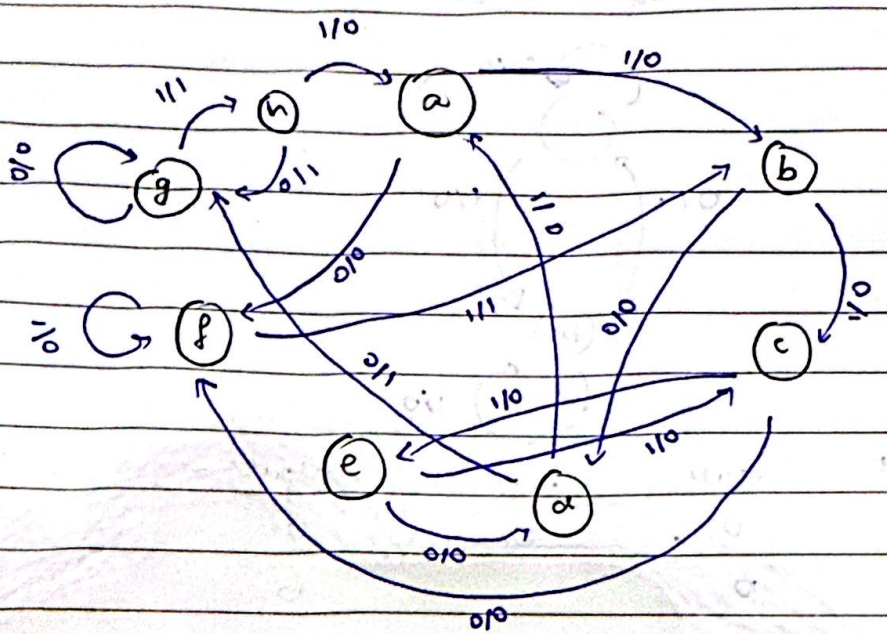
5.12

a)



b) $d = h$.

$b = e$

Present	Next $x=0$	Next $x=1$	Output $x=0$	Output $x=1$
a	f	b	0	0
b	d	c	0	0
c	f	b	0	0
d	g	a	1	0
f	f	b	1	1
g	g	a	0	1

Same

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Present	Next		output	
	0	1	0	1
a	f	b	0	0
b	d	a	0	0
d	g	a	1	0
f	f	b	1	1
g	g	d	0	1

5.13.

a) State: a f b c e d g h g g h a

Input: 0 1 1 1 0 0 1 0 0 1 1

Output: 0 1 0 0 0 1 1 1 0 1 0

b) a = c

d = h

b = e

State: a f b a b d g d g g d a

Input: 0 1 1 1 0 0 1 0 0 1 1

Output 0 1 0 0 0 1 1 1 0 1 0

5.14.

Table 5.9

State	Ass. 1
a	000
b	001
c	010
d	011
e	100

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5.8 Reduced Table.

Previous	Next		Output	
	x=0	x=1	x=0	x=1
a	a	b	0	0
b	c	d	0	0
c	a	d	0	0
d	e	d	0	1
e	a	d	0	1

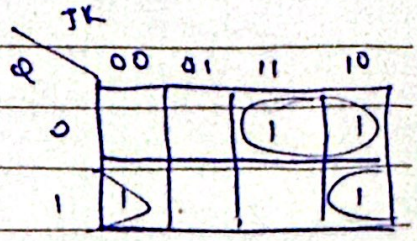
Solution: P.C binary N.S (x=0, x=1)

a	000	000	001
b	001	010	011
c	010	000	011
d	011	100	011
e	100	000	011

5.15. $Q_{t+1} = \bar{Q}J + Q\bar{K}$

P.S	Inputs J	Inputs K	N.S
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

Q	Q_{t+1}	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0



$Q_{t+1} = \bar{Q}J + Q\bar{K}$

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