19F-0228

Q1 Convert each of the final following expressions into sum of products and product of sums

a) $(v+xw)(x+\bar{v}V)$

$(v+xw)(x+\bar{v}V)$.

$vx+v\bar{v}V+xw+xw\bar{v}V$

$vx+0+xw(1+\bar{v}V)$

$vx+xw \longrightarrow$ sum of products

$x(v+w) \longrightarrow$ product of sums

b) $\bar{x}+x(x+\bar{y})(y+\bar{z})$

$\bar{x}+x(x+\bar{y})(y+\bar{z})$

$(\bar{x}+x)[\bar{x}+(x+\bar{y})(y+\bar{z})]$

$(\bar{x}+x+\bar{y})(\bar{x}+y+\bar{z})$

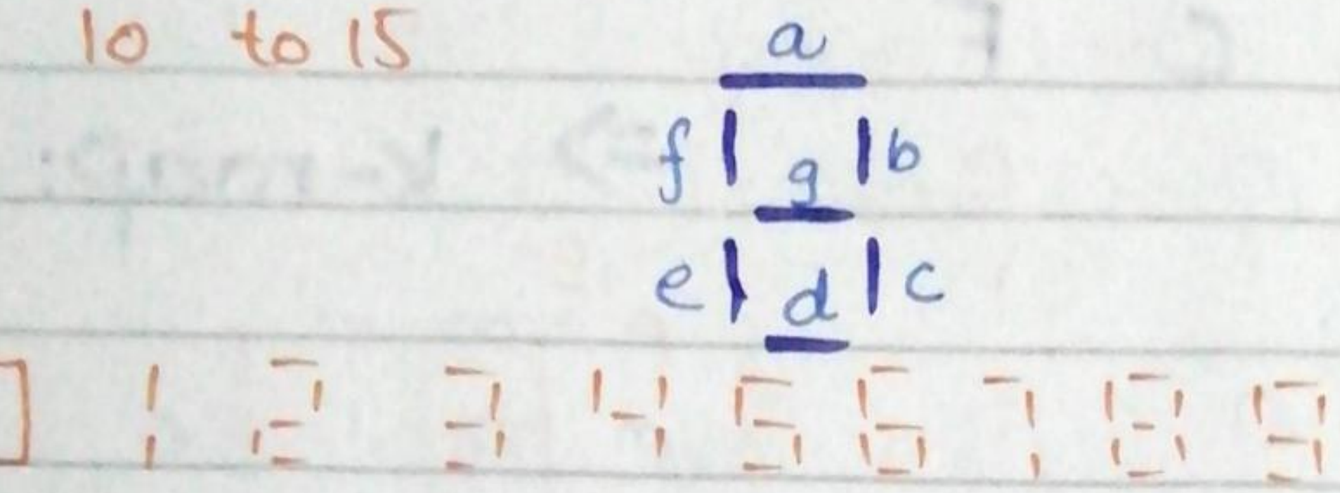
↳ product of sums

$\bar{x}+y+\bar{z} \longrightarrow$ sum of products

Q2: 19F-0228

Complete and design BCD to 7 segment Display circuit.

UNUSED COMBINATION GIVE E FOR ERROR. from 10 to 15



Solution:

Truth table

A	B	C	D	a	b	c	d	e	f	g
0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	0	1	1	0	0	0	0
0	0	1	0	1	1	0	1	1	0	1
0	0	1	1	1	1	1	1	0	0	1
0	1	0	0	0	1	1	0	0	1	1
0	1	0	1	1	0	1	1	0	1	1
0	1	1	0	1	0	1	1	1	1	1
0	1	1	1	1	1	1	0	0	0	0
1	0	0	0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	1	0	1	1
1	0	1	0	1	0	0	1	1	1	1
1	0	1	1	1	0	0	1	1	1	1
1	1	0	0	1	0	0	1	1	1	1
1	1	0	1	1	0	0	1	1	1	1
1	1	1	0	1	0	0	1	1	1	1
1	1	1	1	1	0	0	1	1	1	1

K-maps

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	1	1
11	X	X	X	X
10	1	1	X	X

$F(A,B,C,D) = BD + A + C + \bar{B}\bar{D}$

AB \ CD	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	0	0	0	0
10	1	0	1	0

$F = \bar{A}\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{C}\bar{D} + \bar{A}CD$

AB \ CD	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	0	0	0	0
10	1	1	0	0

$F = \bar{A}D + \bar{A}B + \bar{B}\bar{C}$

AB \ CD	00	01	11	10
00	1	0	1	1
01	1	1	1	1
11	0	0	0	0
10	1	1	0	0

$F = A + C\bar{D} + B\bar{C}D + \bar{B}C + \bar{B}\bar{D}$

AB \ CD	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	1	1	1	1
10	1	0	1	1

$F = AB + C\bar{D} + A\bar{C} + \bar{B}\bar{D}$

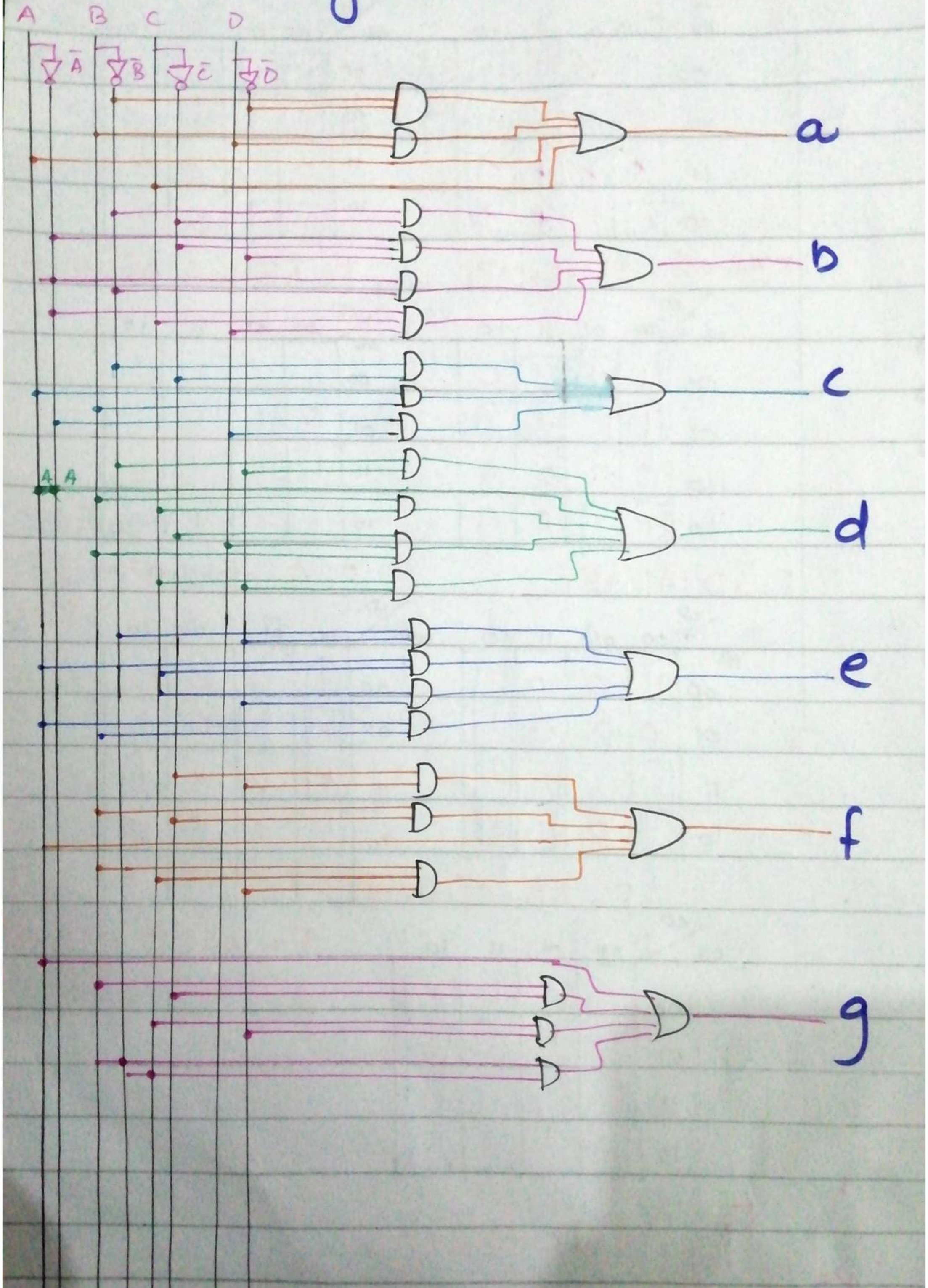
AB \ CD	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

$F = A + \bar{C}\bar{D} + B\bar{C} + B\bar{D}$

AB \ CD	00	01	11	10
00	0	0	1	1
01	1	1	0	1
11	1	1	1	1
10	1	1	1	1

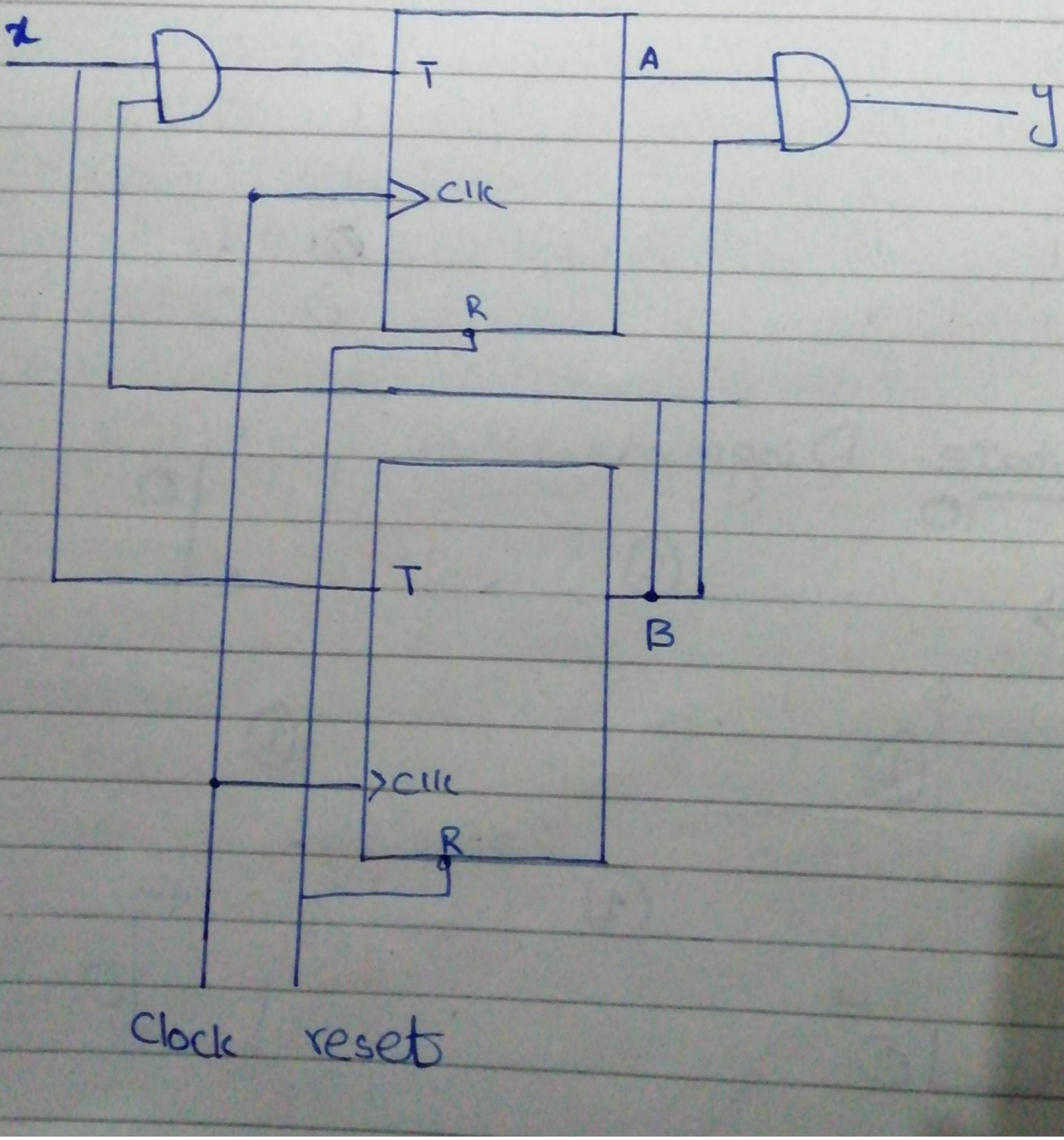
$\bar{F} = A + C\bar{D} + B\bar{C} + \bar{B}C$

Circuit Diagram.



19F-0228 Q3

Analysis of ~~clocked~~ Sequential Circuit to write state table form, second form also draw state diagram.



State Equations :

$$T_A = B \cdot x$$

$$T_B = x$$

$$Y = AB$$

A(t+1), (B t+1) equation is

$$A(t+1) = T_A \oplus A = Bx \oplus A = Bx \oplus A$$

$$= (Bx)' \cdot A + (Bx) \cdot \bar{A}$$

$$A(t+1) = A\bar{B} + A\bar{x} + \bar{A} \cdot B \cdot x$$

$$B(t+1) = T_B \oplus B = x \oplus B$$

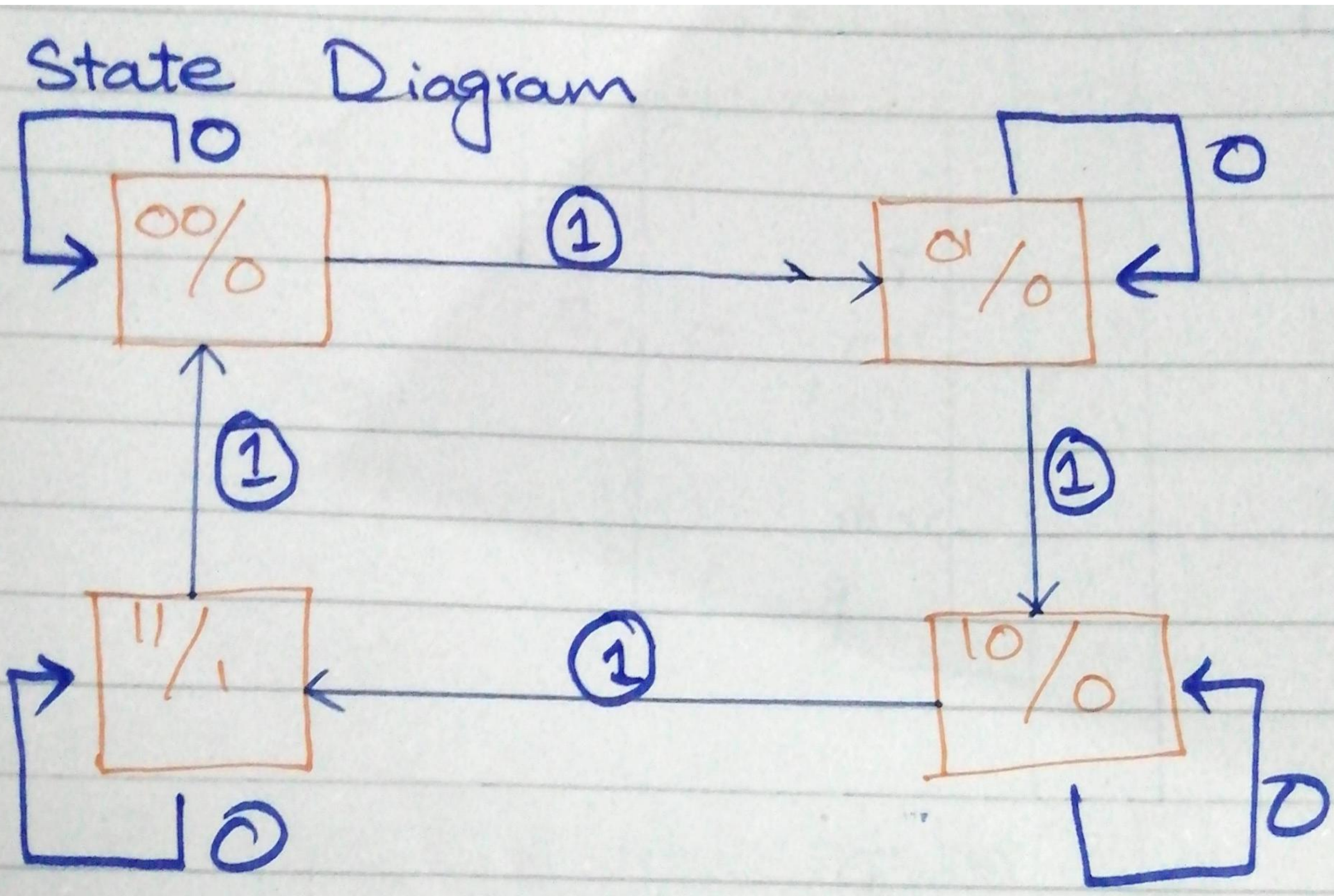
1st Form

Present State		Input	Next State		Output
A	B	x	A	B	y
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	1	0
0	1	1	1	0	0
1	0	0	1	0	0
1	0	1	1	1	0
1	1	0	1	1	1
1	1	1	0	0	1

2nd Form

Present		Next State		Output	
		x=0	x=1	x=0	x=1
A	B	AB	AB	X	Y
0	0	00	01	0	0
0	1	01	10	0	0
1	0	10	11	0	0
1	1	11	00	1	1

State Diagram



Q4 19F-0228

Design a counter with T flip-flops that goes through the following binary repeated sequence:

0, 1, 3, 7, 6, 4

010, 101 don't care conditions

Draw logic Diagram

Present state			Next state					
A	B	C	$A_{(t+1)}$	$B_{(t+1)}$	$C_{(t+1)}$	T_A	T_B	T_C
0	0	0	0	0	1	0	0	1
0	0	1	0	1	1	0	1	0
0	1	0	X	X	X	X	X	X
0	1	1	1	1	1	1	0	0
1	0	0	0	0	0	1	0	0
1	0	1	X	X	X	X	X	X
1	1	0	1	0	0	0	1	0
1	1	1	1	1	0	0	0	1

K-maps

Equations

for T_A

A \ BC	00	01	11	10
0	0	0	1	X
1	1	X	0	0

$T_A = \bar{A}B + A\bar{B}$

$= A \oplus B$

for T_B

A \ BC	00	01	11	10
0	0	1	0	X
1	0	X	0	1

$T_B = \bar{B}C + B\bar{C}$

$= B \oplus C$

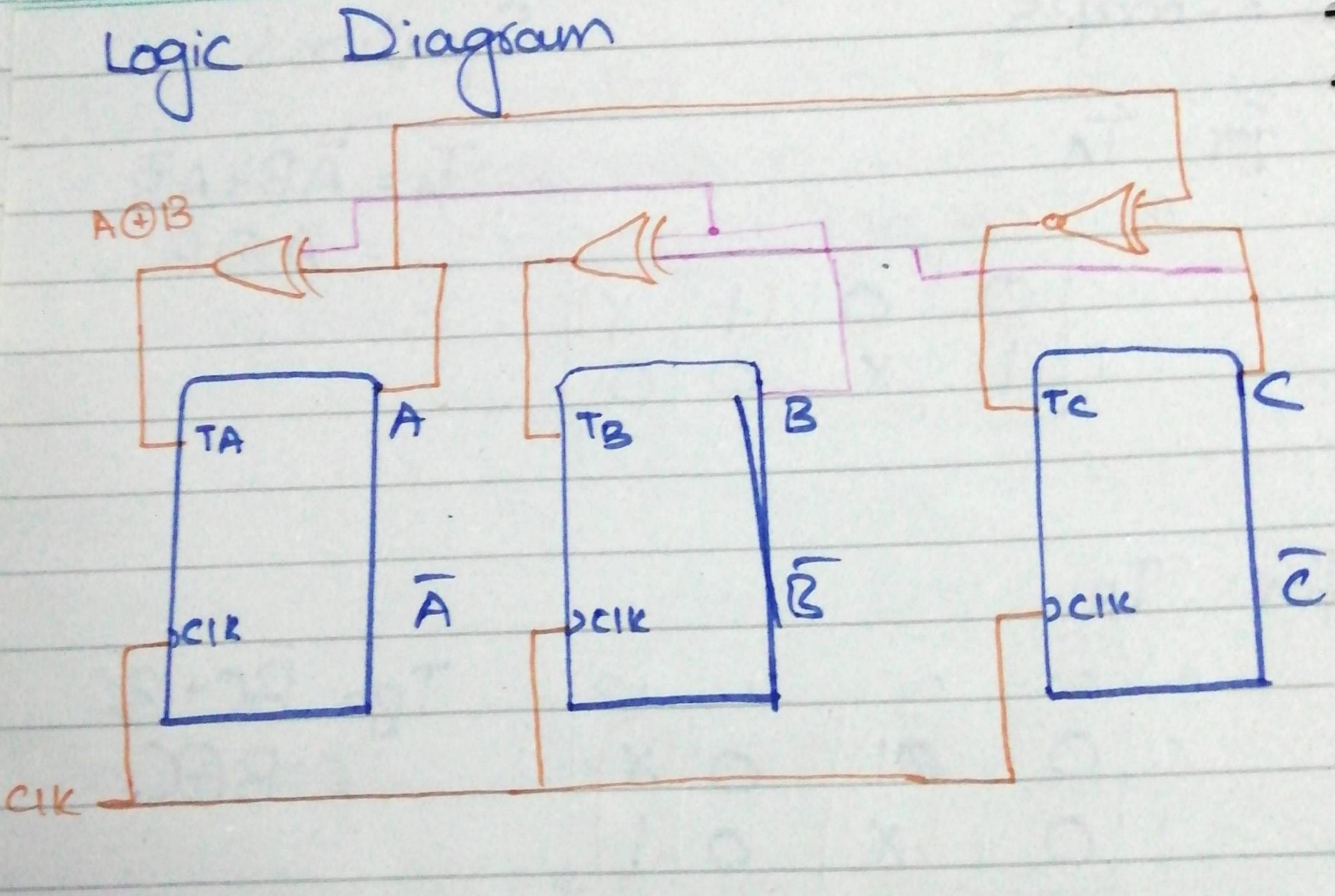
for T_C

A \ BC	00	01	11	10
0	1	0	0	X
1	0	X	1	0

$T_C = \bar{A}\bar{C} + AC$

$= A \cdot C$

Logic Diagram



Q5:

State	Next State				Output (F)			
	xy=00	xy=01	xy=10	xy=11	xy=00	xy=01	xy=10	xy=11
a	b	d	c	b	0	1	1	0
b	a	c	f	d	1	0	1	1
c	b	d	c	b	0	1	1	0
d	b	d	a	b	0	1	1	0
e	b	c	a	b	0	1	1	0
f	c	d	g	f	0	1	1	0
g	a	b	d	g	1	1	0	1

a) Reduced Table:

State	Next State				Output			
	xy=00	xy=01	xy=10	xy=11	xy=00	xy=01	xy=10	xy=11
a	b	a	a	b	0	1	1	0
b	a	a	f	a	1	0	1	1
e	b	a	a	b	0	1	1	0
f	a	a	g	f	0	1	1	0
g	a	b	a	g	1	1	0	1

State diagram: