DLD Project

Alarm Clock

* 4-bit up counter (synchronous) working for the clock

Present State				Next State				J_D	K_D	J_C	K_C	J_B	K_B	J_A	K_A
Q_D	Q_C	Q_B	Q_A	Q_D^+	Q_C^+	Q_B^+	Q_A^+								
0	0	0	0	0	0	0	1	0	X	0	X	0	X	1	X
0	0	0	1	0	0	1	0	0	X	0	X	1	X	X	1
0	0	1	0	0	0	1	1	0	X	0	X	X	0	1	X
0	0	1	1	0	1	0	0	0	X	1	X	X	1	X	1
0	1	0	0	0	1	0	1	0	X	X	0	0	X	1	X
0	1	0	1	0	1	1	0	0	X	X	0	1	X	X	1
0	1	1	0	0	1	1	1	0	X	X	0	X	0	1	X
0	1	1	1	1	0	0	0	1	X	X	1	X	1	X	1
1	0	0	0	1	0	0	1	X	0	0	X	0	X	1	X
1	0	0	1	0	0	0	0	X	1	0	X	0	X	X	1
1	0	1	0	0	0	0	0	X	1	0	X	X	1	0	X
1	0	1	1	0	0	0	0	X	1	0	X	X	1	X	1
1	1	0	0	0	0	0	0	X	1	X	1	0	X	0	X
1	1	0	1	0	0	0	0	X	1	X	1	0	X	X	1
1	1	1	0	0	0	0	0	X	1	X	1	X	1	0	X
1	1	1	1	0	0	0	0	X	1	X	1	X	1	X	1

kmaps for the up counter

(FOR J_D K_D)

$Q_D Q_C$ \ $Q_B Q_A$	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	X	X	X	X
10	X	X	X	X

$$J_D = Q_C Q_B Q_A$$

$Q_D Q_C$ \ $Q_B Q_A$	00	01	11	10
00	X	X	X	X
01	X	X	X	X
11	1	1	1	1
10	1	1	1	1

$$K_D = Q_C + Q_A + Q_B$$

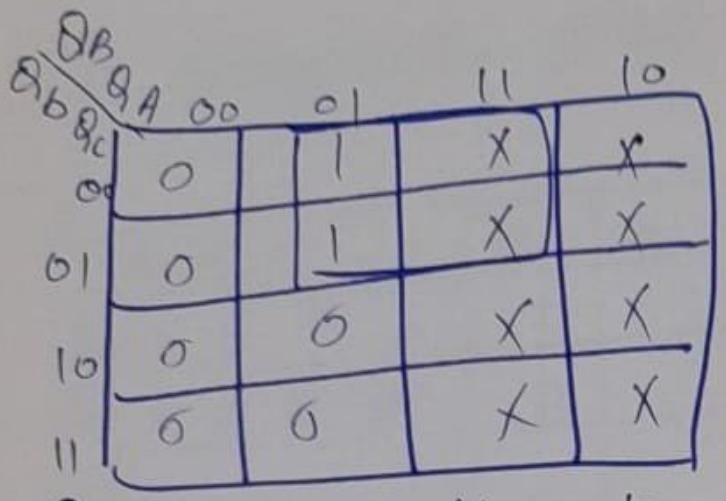
(FOR J_C AND K_C)

$Q_D Q_A$ \ $Q_B Q_A$	00	01	11	10
00	0	0	1	0
01	X	X	X	X
11	X	X	X	X
10	0	0	0	0

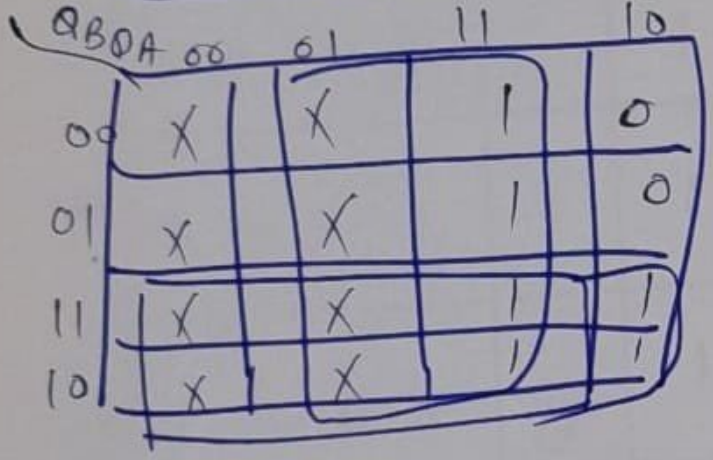
$$J_C = Q_A Q_B \overline{Q_D}$$

$Q_D Q_C$ \ $Q_B Q_A$	00	01	11	10
00	X	X	X	X
01	0	0	1	0
11	1	1	1	1
10	X	X	X	X

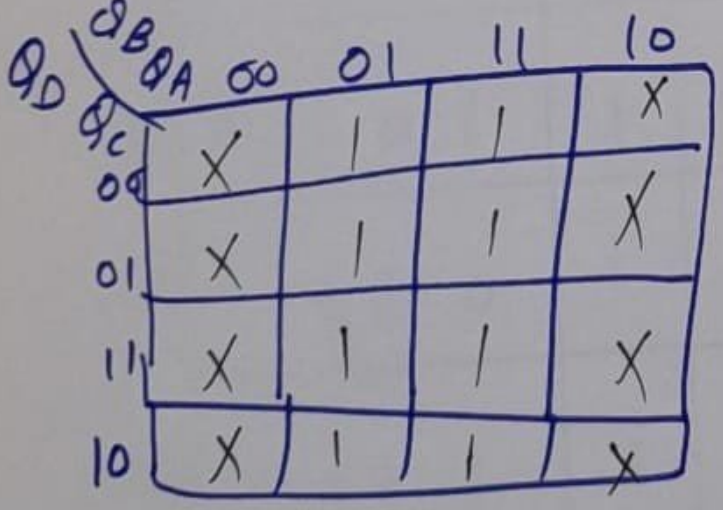
$$K_C = Q_A Q_B + Q_D$$



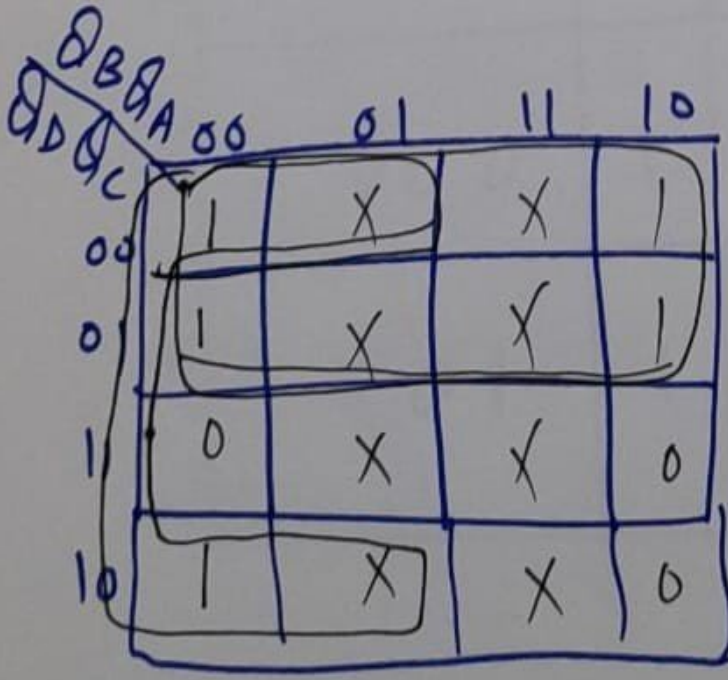
$$J_B = \bar{Q}_D Q_A$$



$$K_B = Q_A + Q_D$$



$$K_a = 1$$



$$J_a = \bar{Q}_D + \bar{Q}_C + \bar{Q}_{\cdot}$$

Logic diagram

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

$b = \bar{B} + CD + \bar{C}\bar{D}$

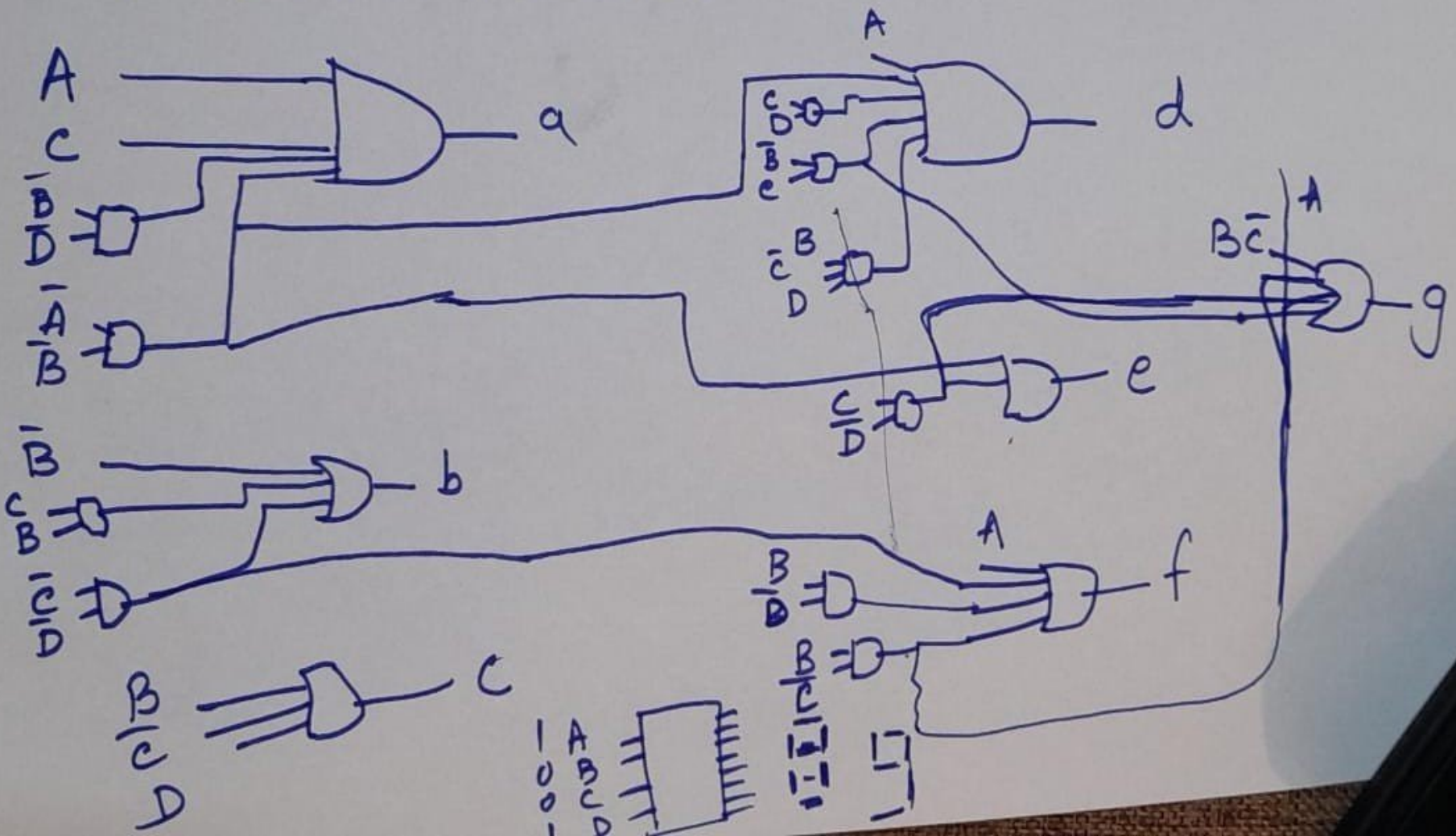
$c = B + \bar{C} + D$

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

$e = \bar{B}\bar{D} + C\bar{D}$

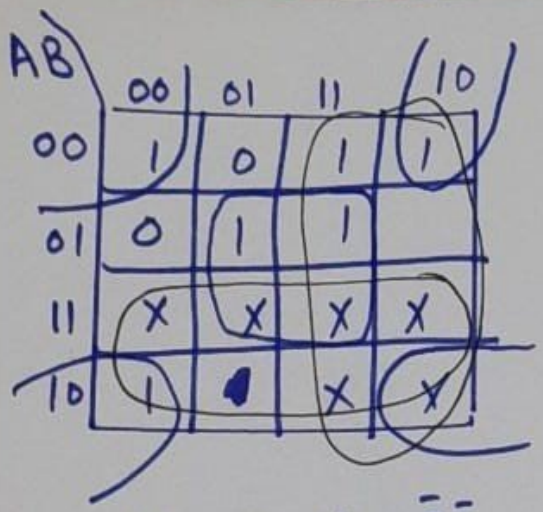
$f = A + \bar{C}\bar{D} + B\bar{D}$

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

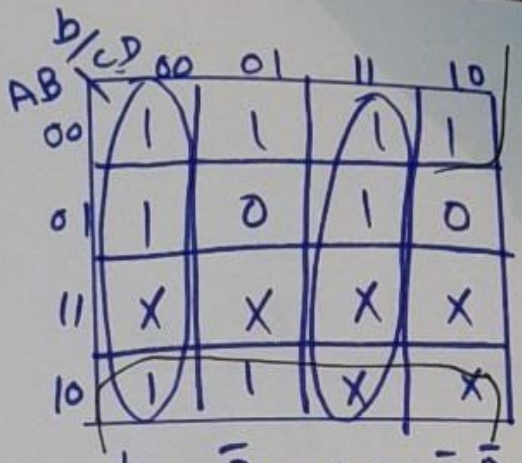


7 segmant display

	A	B	C	D	a	b	c	d	e	f	g
(0)	0	0	0	0	1	1	1	1	1	1	0
(1)	0	0	0	1	0	1	1	0	0	0	0
(2)	0	0	1	0	1	1	0	1	1	0	1
(3)	0	0	1	1	1	1	1	1	0	0	1
(4)	0	1	0	0	0	1	1	0	0	1	1
(5)	0	1	0	1	1	0	1	1	0	1	1
(6)	0	1	1	0	1	0	1	1	1	1	1
(7)	0	1	1	1	1	1	1	0	0	0	0
(8)	1	0	0	0	1	1	1	1	1	1	1
(9)	1	0	0	1	1	1	1	1	0	1	1

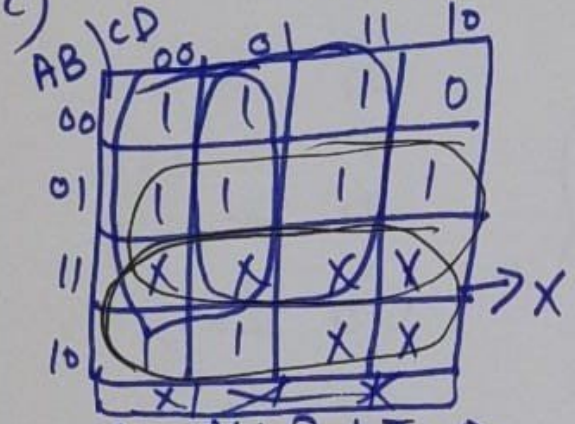


$a = C + A + \bar{B}\bar{D} + BD$



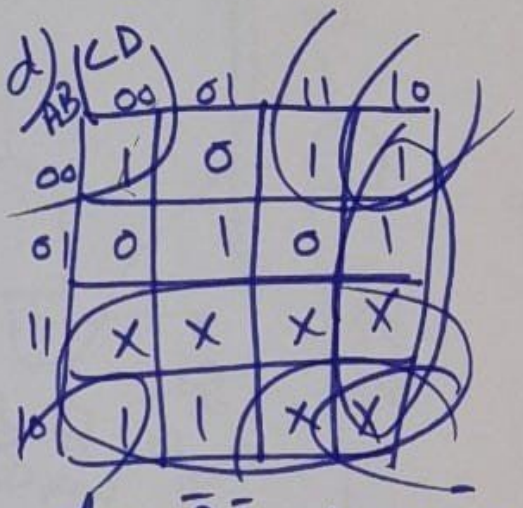
$b = \bar{B} + CD + \bar{C}\bar{D}$

c)



$C = X + \underline{B} + \bar{C} + D$

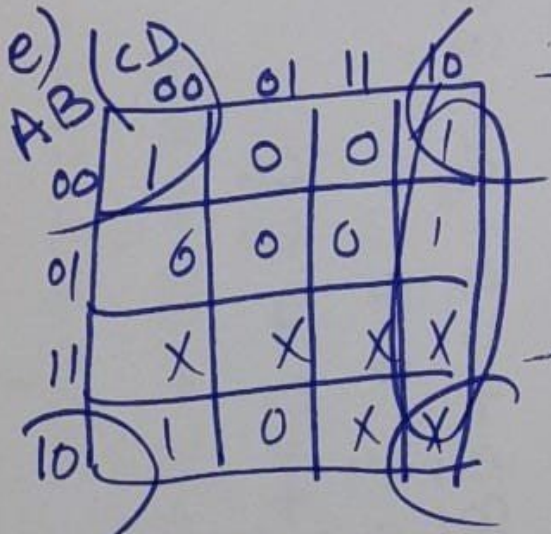
d)



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

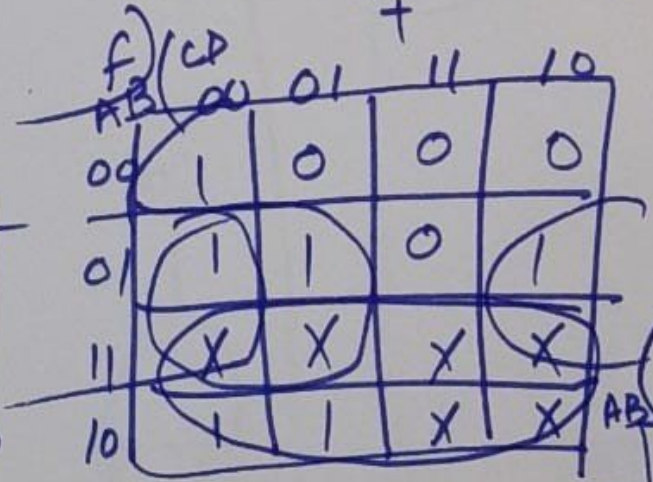
+

e)



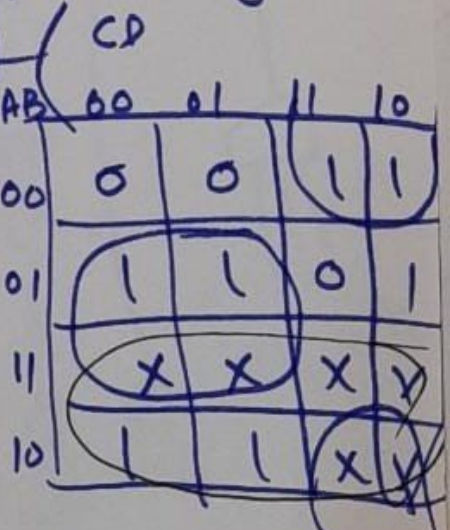
$e = \bar{B}\bar{D} + C\bar{D}$

f)



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

g)



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