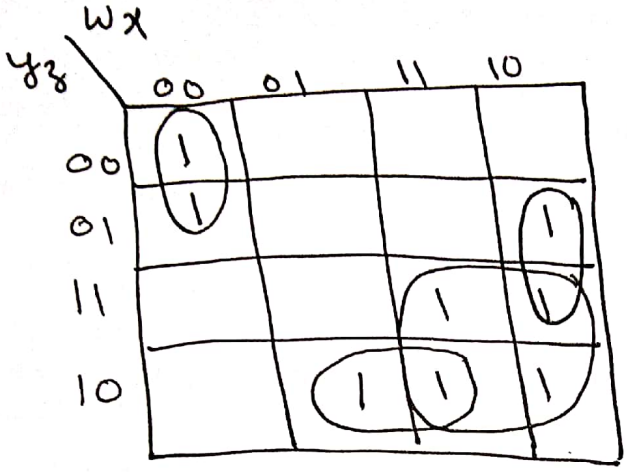
LONG ASSIGNMENT SOLUTIONS

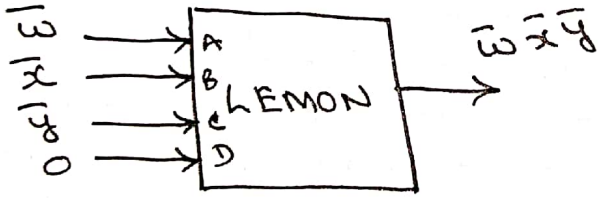
6. LEMON(A,B,C,D) = BC(A+D)

$f(w,x,y,z) = \Sigma m(0,1,6,9,10,11,14,15)$



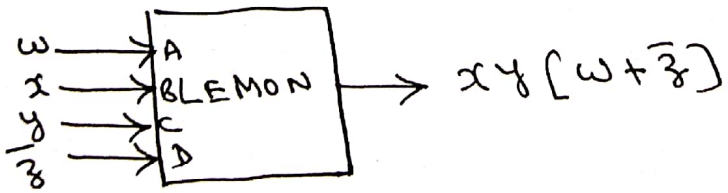
$\therefore f(w,x,y,z) = \bar{w}\bar{x}\bar{y} + xy\bar{z} + wy + w\bar{x}z$
(a)
$\bar{x}\bar{y}z$

LEMON(w,x,y,z) = xy(w+z)

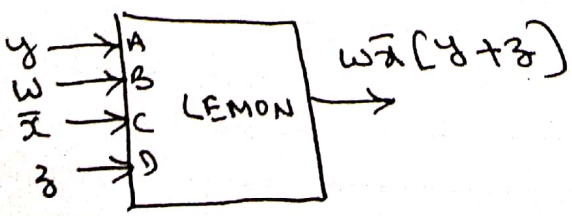


$\bar{w}\bar{x}\bar{y}$

$xy\bar{z} + wy(x+\bar{x}) + w\bar{x}z = xy[w+\bar{z}] + w\bar{x}[y+z]$



$xy[w+\bar{z}]$



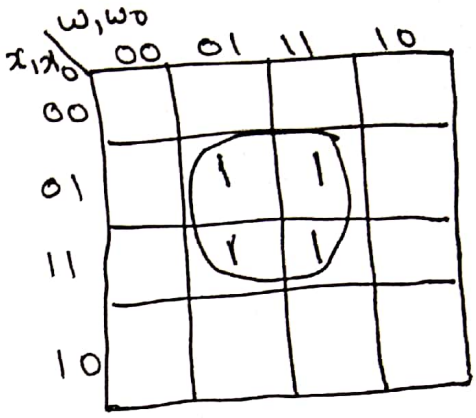
$w\bar{x}[y+z]$

7. Let the numbers are w_1, w_0 and x_1, x_0 and the outputs be $y_3 y_2 y_1$ and y_0

Truth table

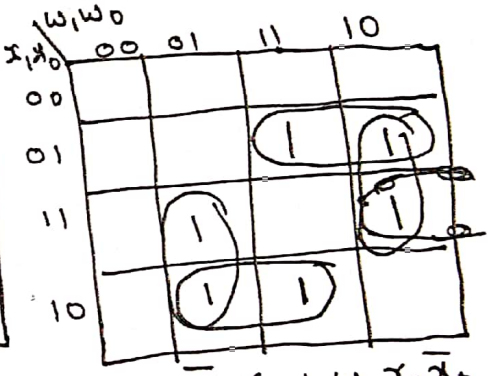
w_1 w_0	x_1 x_0	y_3 y_2 y_1 y_0
0 0	0 0	0 0 0 0
0 0	0 1	0 0 0 0
0 0	1 0	0 0 0 0
0 0	1 1	0 0 0 0
0 1	0 0	0 0 0 1
0 1	0 1	0 0 1 0
0 1	1 0	0 0 1 1
0 1	1 1	0 1 0 0
1 0	0 0	0 0 0 0
1 0	0 1	0 0 1 0
1 0	1 0	0 1 0 0
1 0	1 1	0 1 1 0
1 1	0 0	0 0 0 0
1 1	0 1	0 0 1 1
1 1	1 0	0 1 1 0
1 1	1 1	1 0 0 1

$\therefore y_0 = \sum m(5,7,13,15)$



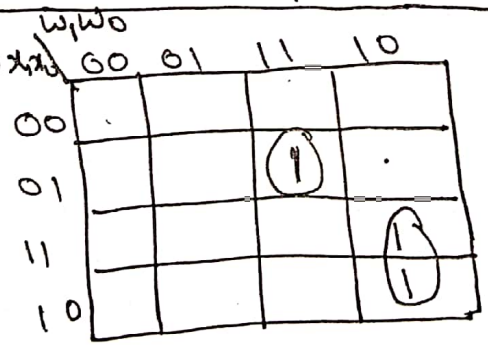
$\therefore y_0 = w_0 x_0$

$y_1 = \sum m(6,7,9,11,13,14)$



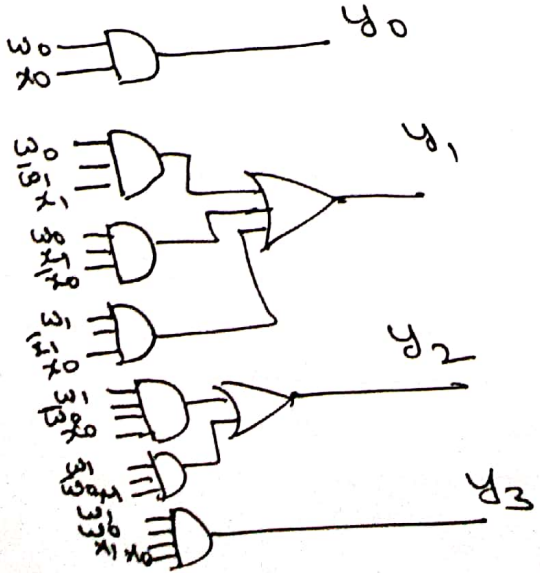
$\therefore y_1 = w_0 \bar{w}_1 x_1 + w_0 x_1 \bar{x}_0 + w_1 \bar{x}_1 x_0 + w_1 \bar{w}_0 x_0$

$y_2 = \sum m(10,11,14)$



$\therefore y_2 = w_1 w_0 \bar{x}_1 x_0 + w_1 \bar{w}_0 x_1$

$y_3 = w_1 w_0 x_1 x_0$



8.

w x y z	f(w,x,y,z)
0 0 0 0	0
0 0 0 1	0
0 0 1 0	0
0 0 1 1	0
0 1 0 0	1
0 1 0 1	1
0 1 1 0	0
0 1 1 1	0
1 0 0 0	1
1 0 0 1	1
1 0 1 0	0
1 0 1 1	0
1 1 0 0	0
1 1 0 1	0
1 1 1 0	0
1 1 1 1	0

$\therefore f(w,x,y,z) = \Sigma m(4,5,8,9)$

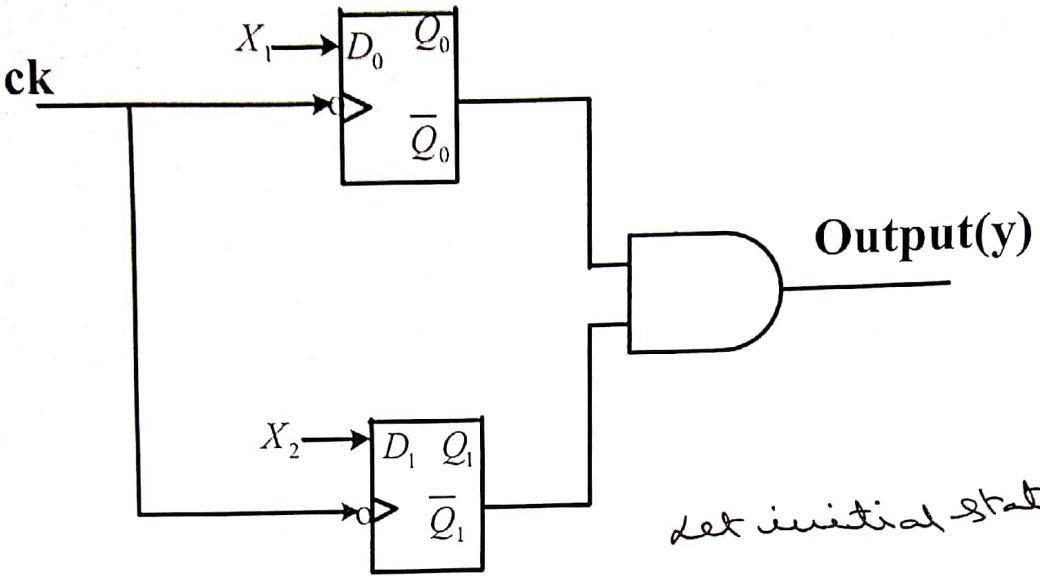
9.

Present state	FF input functions	Next state
$Q_2 Q_1 Q_0$	$J_2 K_2$ $J_1 K_1$ $J_0 K_0$	$Q_2 Q_1 Q_0$
0 0 0	0 1 1 1 1 1	0 0 1
0 0 1	0 0 1 1 1 1	0 1 0
0 1 0	0 0 1 1 1 1	0 1 1
0 1 1	0 0 1 1 1 1	0 0 0

→ Modulo-4 counter.

Q_1 changes when and only when Q_0 changes from 1 to 0

10.



Let initial state $Q_1Q_0 = 00$