Practice Sheet 4

Answer key

(1) $f = x\bar{z} + \bar{w}yz + w\bar{x}\bar{y}$

(2) $f = \bar{b}\bar{d} + \bar{b}c + \bar{b}\bar{c}d$

(3) $f_3 = \Sigma m(4) + \phi(8,9)$

$f_4 = \Sigma m(0,1,2,3,4,5,7,8,9,10,11,15) + \Sigma\phi(6,12)$

(4) $f_2 = \Sigma m(0,1,2,3,8,9,10,11) + \Sigma\phi(4,7,12,14,15)$

We include don't care to maximize groups.

(5) $f_2 = \Sigma m(4,9,11,12) + \Sigma\phi(0,2,5,7,8,10,13,14)$

$f_3 = \Sigma m(0,10)$

(6) a) POS

$f = (a+b)(\bar{a}+c+d)(\bar{c}+\bar{d})(\bar{b}+\bar{c})$

SOP

$f = \bar{a}\bar{b} + a\bar{c}\bar{d} + cd + bc$

(7) a) $P_{min} = \Sigma m(0,1,2,3,4,5,6,7,11,15)$

b)

P

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

Q

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

R

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

c) G_1 & G_2 are OR gates

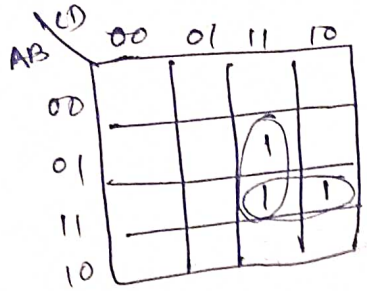
$P_{max} = \Sigma(3,7,11,15)$

(8) $T = (x+y)(\bar{w}+\bar{x}+\bar{z})$

$= (x+y)(\overline{wxz})$

(9)

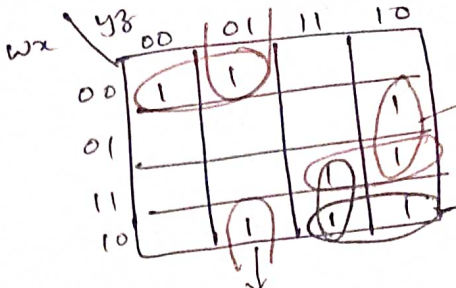
LEMON



$f(w,x,y,z) = \text{lemon 1} + \text{lemon 2} + \text{lemon 3}$

[3 AND + 1 OR]

$f(w,x,y,z)$



Lemon 1 · $wxy + xy\bar{z}$

lemon 3 $w\bar{x}y + wyz$

lemon 2 $\bar{x}\bar{y}z + \bar{w}\bar{x}\bar{y}$

(10)

$$z_0 = y_0 \overline{x_3}$$

$$z_1 = y_0 x_3 + y_1 \overline{x_3}$$

$$z_2 = y_1 x_3 + y_2 \overline{x_3}$$

$$z_3 = y_2 x_3 + y_3 \overline{x_3}$$

$$z_4 = y_3 x_3$$

(11) a)

A	B	S	Y
0	X	0	0
1	X	0	1
X	0	1	0
X	1	1	1

b)

S_1	S_0	A	B	C	D	Y
0	0	0	X	X	X	0
0	0	1	X	X	X	1
0	1	0	X	X		0
0	1	X	1	X	X	1
1	0	X	X	0	X	0
1	0	X	X	1	X	1
1	1	X	X	X	0	0
1	1	X	X	X	1	1

(14)

$$y_3 = x_3$$

$$y_2 = x_2 \cdot \overline{x_3}$$

$$y_1 = x_1 \cdot \overline{x_2} \cdot \overline{x_3}$$

$$y_0 = x_0 \cdot \overline{x_1} \cdot \overline{x_2} \cdot \overline{x_3}$$

(15)

$$P_i = A_i \oplus B_i$$

$$C_i = A_i B_i + A_i \oplus B_i C_{i-1}$$

$$S_i = A_i \oplus B_i \oplus C_{i-1}$$

A_i	B_i	C_i
0	0	0 (A_i/B_i)
0	1	C_{i-1}
1	0	C_{i-1}
1	1	1 (A_i/B_i)