papergrid

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CSCI-212

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ASSIGNMENT 3

Section 5.2

1. Ans:- For Equation (5.1.3) :-

x	$x \cdot 1$
0	0
1	1

For Equation (5.1.4) :-

x	$x + 0$
0	0
1	1

2. Ans:- For Equation (5.1.5) :-

x	y	$x \cdot y$	$y \cdot x$
0	0	0	0
0	1	0	0
1	0	0	0
1	1	1	1

For Equation (5.1.6) :-

x	y	$x + y$	$y + x$
0	0	0	0
0	1	1	1
1	0	1	1
1	1	1	1

3. Ans. For Equation (5.1.7):-

x	$x.0$
0	0
1	0

For Equation (5.1.8):-

x	$x+1$
0	1
1	1

4. Ans. For Equation (5.1.9):-

x	x'	$x.x'$
0	1	0
1	0	0

For Equation (5.1.10):-

x	x'	$x+x'$
0	1	1
1	0	1

5. Ans. For Equation (5.1.11):-

x	x	$x.x$
0	0	0
1	1	1

For Equation (5.1.12):-

x	x	$x+x$
0	0	0
1	1	1

P.T.O

6. Ans. For Equation (5.1.13):-

x	y	z	$y+z$	$x.(y+z)$	$x.y$	$x.z$	$x.y + x.z$
0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

For Equation (5.1.14):-

x	y	z	$y.z$	$x+y.z$	$x+y$	$x+z$	$(x+y).(x+z)$
0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0
0	1	0	0	0	1	0	0
0	1	1	1	1	1	1	1
1	0	0	0	1	1	1	1
1	0	1	0	1	1	1	1
1	1	0	0	1	1	1	1
1	1	1	1	1	1	1	1

Section 5.6

1. Ans. Set a 4-bit integer be $wxyz$ where each literal represents one bit. The given 4-bit integers are given by the function :-

$$F(w, x, y, z) = w'.x'.y'.z' + w'.x'.y.z' + w'.x.y'.z' + w'.x.y.z' + w.x'.y'.z' + w.x'.y.z' + w.x.y'.z' + w.x.y.z$$

Using the distributive property repeatedly we get:

$$F(w,x,y,z) = z'.(w'.x'.y' + w'.x'.y + w'.x.y + w'.x.y + w.x'.y' + w.x'.y + w.x.y' + w.x.y)$$

$$= z'.(w'.(x'.y' + x'.y + x.y' + x.y) + w.(x'.y' + x'.y + x.y' + x.y))$$

$$= z'.(w' + w).(x'.y' + x'.y + x.y' + x.y)$$

$$= z'.(w' + w).(x'.(y' + y) + x.(y' + y))$$

$$= z'.(w' + w).(x' + x).(y' + y)$$

And from the complement property we arrive at a minimal sum of products:

$$F(w,x,y,z) = z'$$

2. Ans:

$F(x, y, z)$

x \ yz	00	01	11	10
0	1	1		1
1	1		1	1

which yields a minimum sum of products:

$$F(x,y,z) = z' + x'.y' + x.y$$

3. Ans. This expression includes minterms 0, 1, 3, 4, and 7.

P.T.O

These appears in a Karnaugh map:-

$F(x, y, z)$

		yz			
		00	01	11	10
x	0	0	0	0	
	1	0		0	

From this Karnaugh map, we can write the function as a minimal product of sums:-

$$F(x, y, z) = (x+y).(y+z).(y'+z')$$

4. Ans Using the Karnaugh map zeros:-

$F(x, y, z)$

		yz			
		00	01	11	10
x	0			0	
	1		0		

we obtain the complement of our desired function:-

$$F'(x, y, z) = x'.y.z + x.y'.z$$

and from DeMorgan's Law:-

$$F(x, y, z) = (x + y' + z').(x' + y + z')$$

5. Ans $F(x, y, z)$

		xy			
		00	01	11	10
z	0	m_0	m_2	m_6	m_4
	1	m_1	m_3	m_7	m_5

P.T.O

6. Ans. $F(x, y, z)$

$y \backslash xz$	00	01	11	10
0	m_0	m_1	m_3	m_4
1	m_2	m_3	m_7	m_6

7. Ans. The prime numbers correspond to the minterms m_2, m_3, m_5 & m_7. The minterms m_{10}, m_{11}, m_{12}, m_{13}, m_{14}, m_{15} cannot occur so are marked "don't care" on the Karnaugh map.

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

$wx \backslash yz$	00	01	11	10
00	m_0	m_1	1	1
01	m_4	1	1	m_6
11	X	X	X	X
10	m_8	m_9	X	X

which gives :- $F(w, x, y, z) = x.z + x'.y$