Ch. 12.1 Boolean Functions

Q1, 5(a)

1. Find the values of these expressions.

a) $1 \cdot \underline{0} = 1 \cdot 1 = 1$

b) $1+\underline{1} = 1 + 0 = 1$

c) $\underline{0} \cdot 0 = 1 \cdot 0 = 0$

d) $\underline{(1 + 0)} = \underline{1} = 0$

5. Use a table to express the values of each of these Boolean functions.

a) $F(x,y,z)=\underline{x}\ y$

x	y	z	$\underline{x}$	$\underline{x}y$
1	1	1	0	0
1	1	0	0	0
1	0	1	0	0
1	0	0	0	0
0	1	1	1	1
0	1	0	1	1
0	0	1	1	0
0	0	0	1	0

Ch. 12.2   Representing Boolean Functions

Q1(a)(, 3(a), 5

1. **Find a Boolean product of the Boolean variables x , y , and z, or their complements, that has the value 1 if and only if**
   a) x = y = 0, z = 1.

a) We want $\overline{x}$, $\overline{y}$, and z all to have the value 1; therefore, we take the product $\overline{x}\,\overline{y}\,z$.

3. **Find the sum-of-products expansions of these Boolean functions.**
   a) F(x,y,z)=x+y+z

$xyz + xy\overline{z} + x\overline{y}\,z + \overline{x}yz + x\overline{y}\,\overline{z} + \overline{x}y\,\overline{z} + \overline{x}\,\overline{y}\,z$

5. **Find the sum-of-products expansion of the Boolean function F(w,x,y,z) that has the value 1 if and only if an odd number of w, x, y, and z have the value 1.**

$C(4,\,\mathbf{1}) + C(4,\,3) = 8$ terms.

$wxy\overline{z} + wx\overline{y}\,\overline{z} + w\overline{x}yz + \overline{w}xyz + w\overline{x}\,\overline{y}\,\overline{z} + \overline{w}x\,\overline{y}\,\overline{z} + w\overline{x}\,\overline{y}\,\overline{z} + \overline{w}\,\overline{x}\,\overline{y}\,z$