22C:060 Computer Organization

Assignment 2

Sample solution

Answer 2(b)

x	y	z	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Answer 4. (For simplicity, I am writing x as x')

$$\overline{(x.y + x'.z + y.z')}$$

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

Answer 10(c) $F(x, y, z) = \overline{(x + y)}\ \overline{(x' + y')}$

$$= (x'.y') . (x.y) \qquad \text{(DeMorgan's theorem)}$$

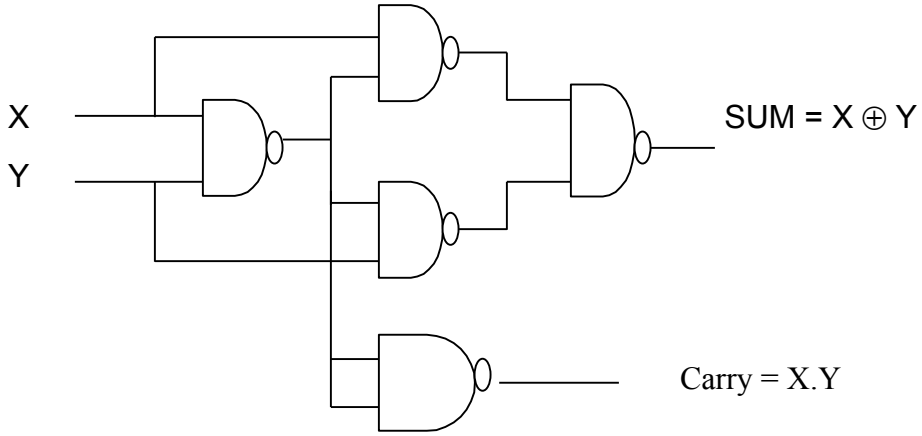
$$= 0$$

Answer 28 If you simplify, then you will find that

$$F = (x + x'.y) \oplus (x'.z) = (x + y) \oplus (x'.z)$$

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Answer 32 The simplest circuit is as follows:



There are other circuits that take 5 gates to implement XOR, and can be derived from the definition of XOR $x \oplus y = x.y' + x'.y$. First implement it using AND OR NOT gates, and then substitute each gate with its NAND equivalent (we have already done this exercise when we studied why NAND gates are universal gates. See Section 3.3.2 pp 103-104).