COSC 290.002

Class Exercises #6

1. **Truth Table**

Construct a truth table for the following:

1. F(x,y,z) = y’z + x’z

|  |  |  |  |
| --- | --- | --- | --- |
| x | y | z | F |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 |

1. F(x, y, z) = x’y’z + xy

|  |  |  |  |
| --- | --- | --- | --- |
| x | y | z | F |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

1. Assume you have the following truth tables for functions F1(x, y, z) and F2(x, y, z):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | y | z | F1 | F2 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |

1. Express F1 and F2 in sum-of-products form

F1 = (x’y’z’) + (x’y’z) + (xy’z) + (xyz’)

F2 = (x’yz’) + (xy’z’) + (xyz’)

1. Simplify each function

F1 = x’y’ + y’z + xyz’

F2 = xz’ + yz’

1. Consider two Boolean functions, f(x,y,z) and g(x,y,z). Use truth tables to prove the two functions, f(x,y,z) and g(x,y,z) are logically equivalent or not.

f**(x,y,z)=x(y’z + y) + x’(y + z’)’ g(x,y,z) = yz’ + xy**

**A screenshot of a computer

Description automatically generated**

F1 is not logically equivalent to F2 because for x,y,z = 001, 010, and 101, the functions have differing outputs. This means that they are not logically equivalent by definition of logically equivalent.

1. Little Susie is trying to train her new puppy. She is trying to figure out when the puppy should get a dog biscuit as a reward. She has concluded the following:
   1. Give the puppy a biscuit if it sits and wiggles but does not bark.
   2. Give the puppy a biscuit if it barks and wiggles but does not sit.
   3. Give the puppy a biscuit if it sits but does not wiggle or bark
   4. Give the puppy a biscuit if it sits wiggles, and barks.
   5. Don’t give puppy a treat otherwise.

Use the following:

S: Sit (0 for not sitting; 1 for wiggling)

W: (Wiggles (0 for not wiggling; 1 for wiggling)

B: Barking (0 for not barking; 1 for barking)

F: Biscuit function (0, don’t give the puppy a biscuit; 1, give the puppy a biscuit)

Construct a truth table and find the minimized Boolean function to implement the logic telling Susie when to give her dog a biscuit.

**A table with numbers and letters

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F = (S’WB) +(SW’B’) + (SWB’) + (SWB)

Reduces to:

**F = WB + SB’**