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Homework 5

1. There would be 48 entries in total.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | D | F |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |

1. Gate 1: if we take (a + b) to be x, we can use the idempotent law to say that x + x = x, and thus when we substitute (a + b) back in for x we get (a+ b) + (a + b) = (a + b), which is the Boolean function for an or gate.

Gate 2: is the original Boolean function of the logic circuit. Since the single nor gate takes two of the same input, i.e. either 1 and 1 or 0 and 0, the output will be the inverse of the two inputs.

Gate 3: should be equal to an and gate, which is represented by the Boolean equation. Using the principle from gate 2, which proves that a nor gate with the same input is equivalent to a not gate, we can now say the equation is . Now using DeMorgan’s law, which states , we not have the equation , thus proving the correctness of the logic circuit.

1. X=x2, x1, x0

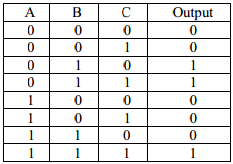
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X2 | X1 | X0 | F1 | F2 | F3 | F4 |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 |

1. XOR:

B

A





C

B

A



C

B

A

1. 

Demorgan’s Laws:

Demorgan’s Laws: =

Distributive Laws: =

Distributive Laws:

The inverse of the identity laws:

Demorgan’s Laws:

Demorgan’s Laws:

1. X’ Y Z’ + X’ Y Z + X Y’ Z’ + X Y Z’ + XYZ = Y + XZ’

Associative law: X’ Y Z’ + X’ Y Z + X Y’ Z’ + X Y Z’ + XYZ = (X’YZ + XY’Z’) + X’YZ’+ XYZ’ + XYZ

Idempotent law : = X’YZ’ + XYZ’ + XYZ

Distributive law : = Y + (X’Z’ + XZ’ + XZ)

Idempotent law : = Y + XZ’



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AB |  |  |  |  |
|  | 00 | 01 | 11 | 10 |
| C=0 | 1 | 1 | 1 | 0 |
| C=1 | 1 | 0 | 1 | 0 |



A

B

C

11.