**Example #1**

F = (A+ B). (A+ C)

=A.A+A.C+B.A+B.C (Disturbutive Law)

=A+A.C+B.A+B.C (Idempotent law)

=A(1+C)+B.A+B.C (Disturbutive Law)

=A.1+B.A+B.C (Identity OR Law)

=A(1+B)+B.C (Disturbutive Law)

=A.1+B.C (Identity OR Law)

=A+B.C (Identity AND Law)

**Diagram

Description automatically generated**

|  |  |  |  |
| --- | --- | --- | --- |
| **A** | **B** | **C** | **(A . B) + (A . C)** |
| 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 |

**Example #2**

F = A.B + B.C. (B + C)

A.B+B.C.B+B.C.C (Disturbutive Law)

A.B+B.B.C+B.C.C (Commutative Law)

A.B+B.C+B.C.C (Idempotent law)

A.B+B.C+B.C (Idempotent law)

A.B+B.C (Idempotent law)

B.(A+C) (Disturbutive Law)

**Diagram

Description automatically generated**

|  |  |  |  |
| --- | --- | --- | --- |
| **A** | **B** | **C** | **A.B + B.C.(B + C)** |
| 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |

**Example #3**

𝐹 = (𝐴)(𝐴 + 𝐵) + (𝐵 + 𝐴)(𝐴 + (𝐵)

=A.A+B.A+(B+A)A+(B+A)B (Disturbutive Law)

=B.A+(B+A)A+(B+A)B (Complement Law)

=B.A+B.A+A.A+B.B+A.B (Disturbutive Law)

=B.A+B.A+A+B.B+A.B (Idempotent Law)

=B.A+B.A+A +A.B (Complement Law)

B(A+A)+A(1+B) (Disturbutive Law)

B.1+A(1+B) (Complement Law)

B.1+A.1 (Annulment Law)

B+A.1 (Identity AND Law)

B+A (Identity AND Law)

A+B (Commutative Law)

**Diagram

Description automatically generated**

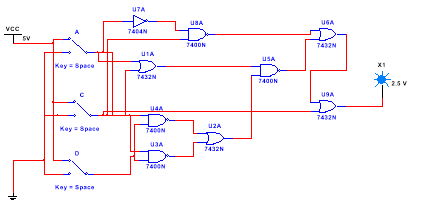
|  |  |  |
| --- | --- | --- |
| **A** | **B** | **(!A)&(A | B) | (B | A)&(A | !B)** |
| 1 | 1 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 0 | 0 | 0 |

**Task: 1**

Simplify the following equation using Boolean Laws. Construct the Truth Tables to verify that the simplified equation gives the same result as that of the original equation.

𝐹 = (𝐴 + 𝐶)(𝐴𝐷 + 𝐴 𝐷) + 𝐴𝐶 + C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **A** | **D** | **C** | **(A+C)** | **A.D** | **(A.D+A.D)** | **A.C** | **(A+C)(AD+AD)** | **(A+C)(AD+AD)+A.C+C** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |



**SOLUTION**

=(A+C)(AD)+A.C+C (Idempotent Law)

=A.A.D+C.A.D+A.C+C (Disturbutive Law)

=A.D+C.A.D+A.C+C (Idempotent Law)

=A.D(1+C)+C(A+1) (Disturbutive Law)

=A.D.1+C(A+1) (Annulment Law)

=A.D.1+C.1 (Annulment Law)

=A.D.1+C (Identity AND Law)

=A.D+C (Identity AND Law)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **D** | **C** | **A.D** | **A.D+C** |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 |

Diagram, schematic

Description automatically generated