Task No 01:

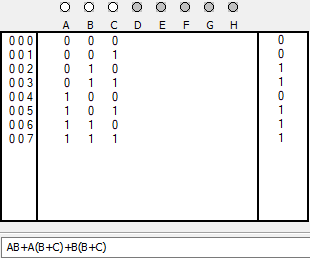
Simplify the following equations using Boolean Laws and design the circuits of both given as well as simplified equations on multisim. Construct the Truth Tables to verify that the simplified equations give the same result as that of the original equation.

1. F = AB + A (B + C) + B (B + C)
2. F = (A + C) (AD + AD′) + AC + C
3. F = A′ (A + B) + (B + A) (A + B′)
4. F = A ⋅ (B + C) + A′ ⋅ (B + C)
5. F = A′ B′ C′ D + A′ B′ CD + A′ BCD + ABCD + AB′ CD

Solution:

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

Un-Simplified Equation Truth Table:

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Un-Simplified Equation Circuit:A diagram of a circuit

Description automatically generated

Simplification:

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

F = AB + AB + AC + BB + BC

F = AB + AC + B + BC

F = AB + AC + B(1 + C)

F = AB + AC + B(1)

F = AB + AC + B

F = AB + B + AC

F = B(A + 1) + AC

F = B(1) + AC

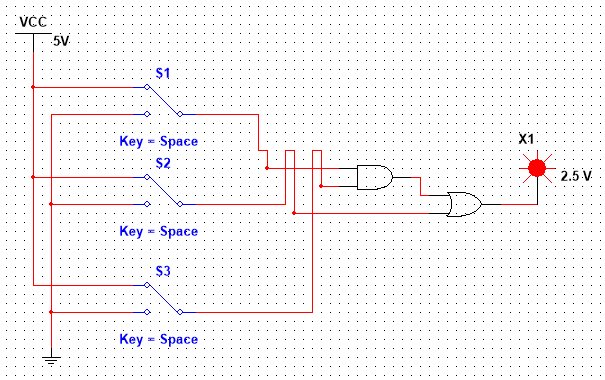
F = AC + B

Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Simplified Equation Circuit:

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1. F = (A + C) (AD + AD′) + AC + C

Un-Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Un-Simplified Equation Circuit:**A diagram of a circuit

Description automatically generated**

Simplification:

F = (A + C) (AD + AD’) + AC + C

F = (A + C) (AD + AD’) + C(A + 1)

F = (A + C) {A(D+ D’)} + C(1)

F = (A + C) {A(1)} + C

F = (A + C) (A) + C

F = AA + AC + C

F = A + C(A +1)

F = A + C(1)

F = A + C

Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Simplified Equation Circuit:

**A diagram of a rocket

Description automatically generated**

1. F = A′ (A + B) + (B + A) (A + B′)

Un-Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Un-Simplified Equation Circuit:

**A diagram of a circuit

Description automatically generated**

Simplification:

F = A′ (A + B) + (B + A) (A + B′)

F = AA’ + A’B + AB + BB’ + AA + AB’

F = 0 + A’B + AB + 0 + A + AB’

F = B(A’ + A) + A(1 + B’)

F = B(1) + A(1)

F = A + B

Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Simplified Equation Circuit:

**A diagram of a key space

Description automatically generated**

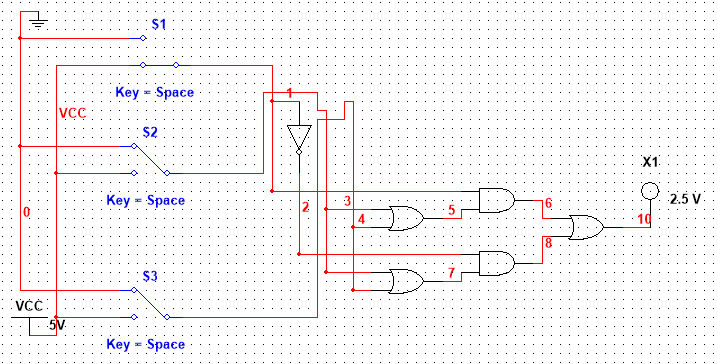
1. F = A ⋅ (B + C) + A′ ⋅ (B + C)

Un-Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Un-Simplified Equation Circuit:

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Simplification:

F = A ⋅ (B + C) + A′ ⋅ (B + C)

F = AB+ AC +A’B + A’C

F = AB + A’B + AC + A’C

F = B(A + A’) + C(A + A’)

F = B(1) + C(1)

F = B + C

Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Simplified Equation Circuit:

**A diagram of a rocket

Description automatically generated**

1. F = A′ B′ C′ D + A′ B′ CD + A′ BCD + ABCD + AB′ CD

Un-Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Un-Simplified Equation Circuit:

**A diagram of a circuit

Description automatically generated**

Simplification:

F = A′B′C′D + A′B′CD + A′BCD + ABCD + AB′CD

F = A’B’C’D + A’CD(B’ + B) + ACD(B + B’)

F = A’B’C’D + A’CD(1) + ACD(1)

F = A’B’C’D + CD(A’ + A)

F = A’B’C’D + CD(1)

F = A’B’C’D + CD

Simplified Equation Truth Table:

**A screenshot of a computer

Description automatically generated**

Simplified Equation Circuit:

A diagram of a circuit

Description automatically generated