

**Problem 1:**

**Computer Science or Information Technology**

Instructor: Dr. G.E. Antoniou

Day, Month, Year

Day

CSIT 502

Department of CSIT

Assessment

Module-2

Hidalgo, Rafael

Simplify, using algebraic manipulations, the following Boolean expression to a minimum number of terms and factors.

XYZ+X’Y+XYZ’

**Solution**

XYZ+X’Y+XYZ’

XY(Z+Z’) + X’Y

XY + X’Y

Y(X + X’)

Y

**Problem 2:**

Simplify, using algebraic manipulations, the following Boolean expression to a minimum number of terms and factors.

(XY)’ (X’ + Y )(Y’ + Y )

**Solution**

(XY)’ (X’ + Y )(Y’ + Y )

(XY)’ (X’ + Y )

(X’ + Y’)(X’+ Y)

X’X’ + X’Y + Y’X’ + Y’Y

X’ + X’Y + Y’X

X’(1 + Y + Y’)

X’

**Problem 3:**

Find the complement and simplify the following expression, to a minimum number of terms and factors.

XY’ + X’Y

**Solution**

(XY’ + X’Y)’

(XY’)’ ( X’Y)’

(X’ + Y’’) (X’’ + Y’)

(X’ + Y) (X + Y’)

X’X + X’Y’ + YX + YY’

X’Y’+YX

**Problem 4:**

Find the complement and simplify the following expression, to a minimum number of terms and factors.

XY + X’Y’

**Solution**

(XY + X’Y’)’

(XY)’ (X’Y’)’

(X’+Y’)(X+Y)

X’X + X’Y + Y’X + Y’Y

X’Y + Y’X

**Problem 5:**

Using DeMorgan’s Theorem, simplify the following expression, to a minimum nummber of terms and factors.

F = ((AB)’ + A + A’B)’

**Solution**

((AB)’ + A + A’B)’

(AB)’’ A’ (A’B)’

(AB) A’ (A’’ + B’)

(AB) A’ (A +B’)

ABA’(A+B) (A A’) = 0 therefore

0B(A+B)

F= 0

**Problem 6:**

Using DeMorgan’s Theorem, simplify the following expression, to a minimum number of terms and factors.

F = ((ABC’)’ + (C’D)’ + (C’E)’)’

**Solution**

((ABC’)’ + (C’D)’ + (C’E)’)’

(ABC’)’’(C’D)’’(C’E)’’

ABC’C’DC’E

ABC’DE

**Problem 7:**

Simplify the following expression by means of a three–variable K–Map, to a minimum number of terms and factors.

XY + Y Z’+ X’ Y’ Z’

**Solution**

XY + Y Z’+ X’ Y’ Z’

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **X\YZ** | **00** | **01** | **11** | **10** |
| **0** | **1** | **0** | **0** | **1** |
| **1** | **0** | **0** | **1** | **1** |

Simplified expression = X’Z’ +XY

**Problem 8:**

Simplify the following expression by means of a four–variable K–Map, to a minimum number of terms and factors.

A’D + BD + B’C + AB’D

**Solution**

A’D + BD + B’C + AB’D

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **AB\CD** | **00** | **01** | **11** | **10** |
| **00** | **0** | **1** | **1** | **1** |
| **01** | **0** | **1** | **1** | **0** |
| **11** | **0** | **1** | **1** | **0** |
| **10** | **0** | **1** | **1** | **1** |

Simplified expression = D +CB’

**Problem 9:**

Simplify the following expression by means of a four–variable K–Map, to a minimum number of terms and factors.

ABC + CD + BC’D + B’C

**Solution**

ABC + CD + BC’D + B’C

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **AB\CD** | **00** | **01** | **11** | **10** |
| **00** | **0** | **0** | **1** | **1** |
| **01** | **0** | **1** | **1** | **0** |
| **11** | **0** | **1** | **1** | **1** |
| **10** | **0** | **0** | **1** | **1** |

Simplified expression = DB +B’C + AC

**Problem 10:**

Simplify the following expression by means of a four–variable K–Map, to a minimum number of terms and factors.

ABC + CD + BC’D + B’C, with don’t care condition: x = A’BCD’

**Solution**

ABC + CD + BC’D + B’C, with don’t care condition: x = A’BCD’

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **AB\CD** | **00** | **01** | **11** | **10** |
| **00** | **0** | **0** | **1** | **1** |
| **01** | **0** | **1** | **1** | **X** |
| **11** | **0** | **1** | **1** | **1** |
| **10** | **0** | **0** | **1** | **1** |

Simplified expression = C +DB