Assignment 1 — FPGA Lab

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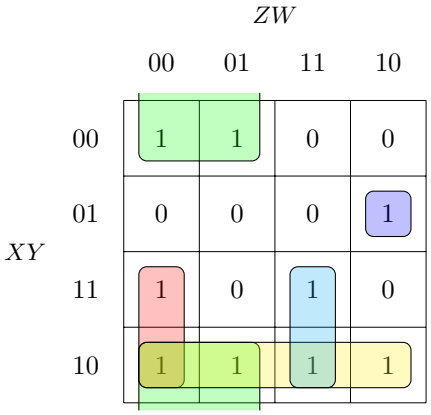
1 Question

Reduce the following Boolean expression to its simplest form using K-Map

$$F(X,Y,Z,W) = \sum(0,1,6,8,9,10,11,12,15) \tag{1}$$

2 Solution

Represent the given Boolean expression in K-Map and follow the K-Map rules to reduce the given Boolean form to simplest form



$$F(X,Y,Z,W) = \overline{Y}.\overline{Z} + X.\overline{Y} + X.\overline{Z}.\overline{W} + X.Z.W + \overline{X}.Y.Z.\overline{W} \tag{2}$$

3 Implimentation using NAND gate

$$F(X,Y,Z,W) = \overline{\overline{\overline{Y}.\overline{Z} + X.\overline{Y} + X.\overline{Z}.\overline{W} + X.Z.W + \overline{X}.Y.Z.\overline{W}}} \tag{3}$$

$$F(X,Y,Z,W) = \overline{\overline{\overline{Y}.\overline{Z}}.\overline{X.\overline{Y}}.\overline{X.\overline{Z}.\overline{W}}.\overline{X.Z.W}.\overline{\overline{X}.Y.Z.\overline{W}}} \tag{4}$$

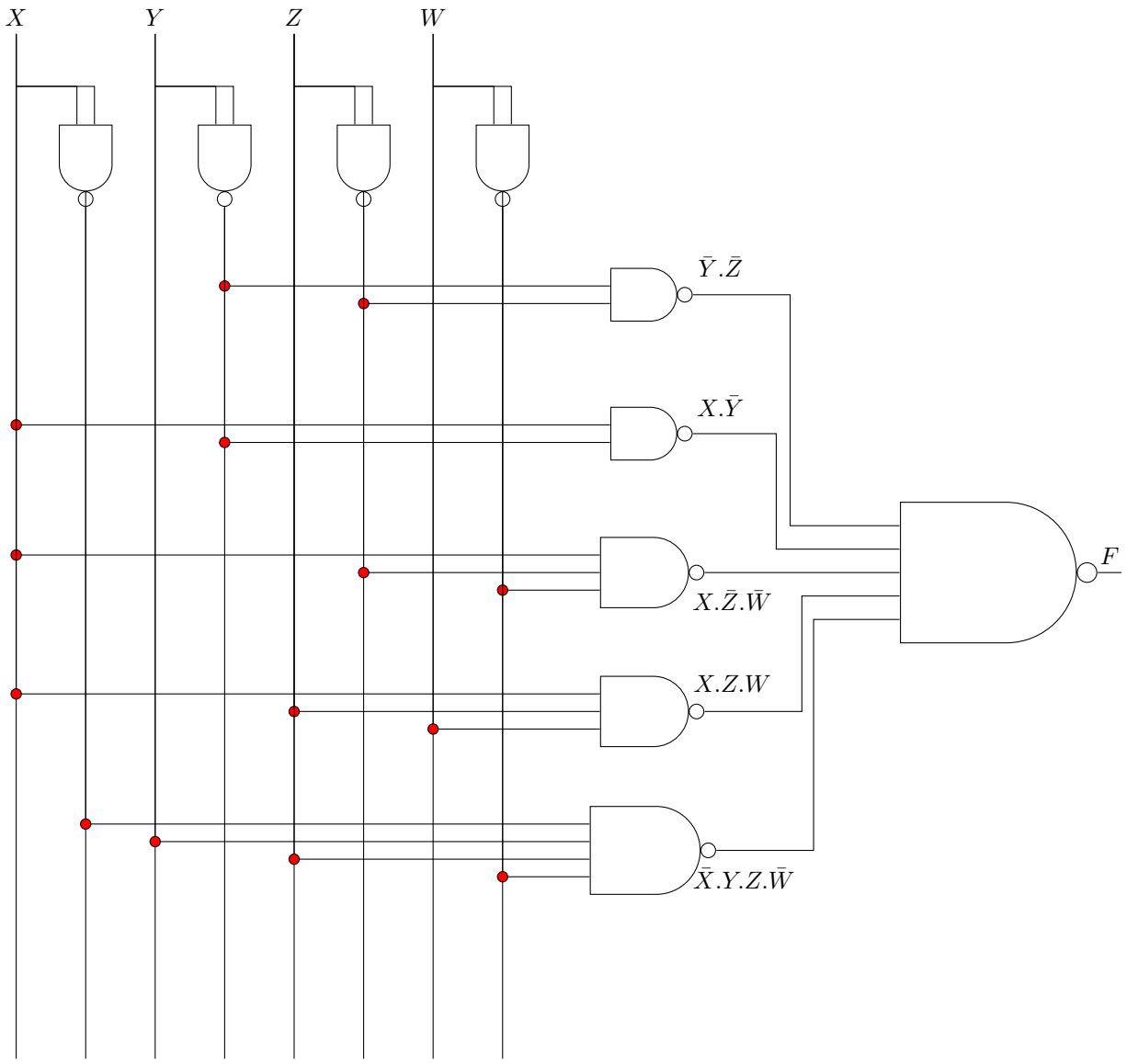


Figure 1: Circuit Diagram for the simplified Boolean expression using NAND gate