Lab 7 – Circuit Reduction (Part 1)

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The purpose of this lab is to:

Learn how to reduce a circuit design down to the smallest size using the 17 Theorems and [Karnaugh](https://en.wikipedia.org/wiki/Karnaugh_map) maps. Part 2 will explore how to reduce the circuit.

Select two 10kohm resistors.

Measure and record the resistance of each resistor.

Equipment needed:

1 – Digital Multimeter

3 – 10Kohm

1 – 4 position dip switch

1 – 74LS04 Hex Inverter

1 – 74LS00 Quad NAND

1 – 74LS11 Triple 3 input AND

1 – 74LS32 Quad OR

Using Multisim simulate Figure 1 for each input and record in Table 1. Then build and test circuit and record in Table 1

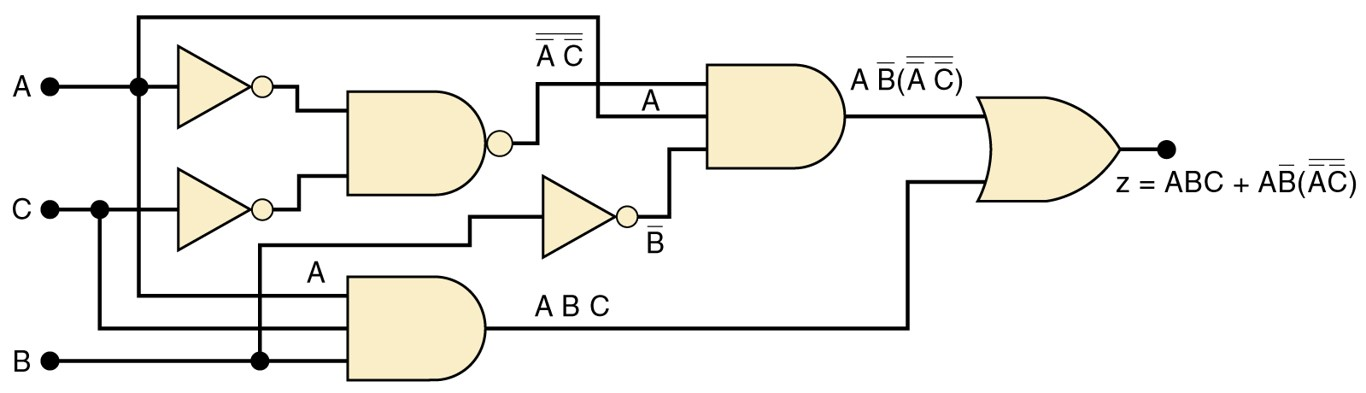




Figure 1- Lab 7 Schematic

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | BC | | | |  |
|  |  | 00 | 01 | 11 | 10 |  |
| A | 0 | 0 | 0 | 0 | 0 |  |
| 1 | 1 | 1 | 1 | 0 |  |
|  |  |  |  |  |  |  |
|  | X = AB̅C̅+AB̅C+ABC | | | | | SOP form |
|  |  |  |  |  |  |  |
|  | X = A(B̅+C) | | | | | POS form |
|  |  |  |  |  |  |  |

Table 2 Karnaugh Map of circuit

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Simulated | | | |  | Test | | | |
| A | B | C | Output |  | A | B | C | Output |
| 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |  | 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |  | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |  | 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |  | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |  | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |  | 1 | 1 | 1 | 1 |

Table 1 Simulation vs Test

Using simulation and test results complete the Karnaugh Map in Table 2 and express the Boolean results in SOP and POS format.

Observations: A Karnaugh Map rearranges a truth table into two dimensions so that it is easier to see how the inputs affect the outputs.