# DD Lab 1 Assignment

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2020A3PS0435P

September 4, 2021

## Canonical SOP form

Given Equation: $\bar{A} \cdot (B + \bar{C}) + D$
Canonical SOP Form:

$$ABCD + \bar{A}BCD + A\bar{B}CD + AB\bar{C}D + \bar{A}\bar{B}CD + \bar{A}B\bar{C}D + \bar{A}BC\bar{D}$$
$$+A\bar{B}\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}\bar{C}\bar{D}$$

### Truth table

(Same obtained for both realisations of the circuit)

| a | b | c | d | x |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

## Simple gates realisation

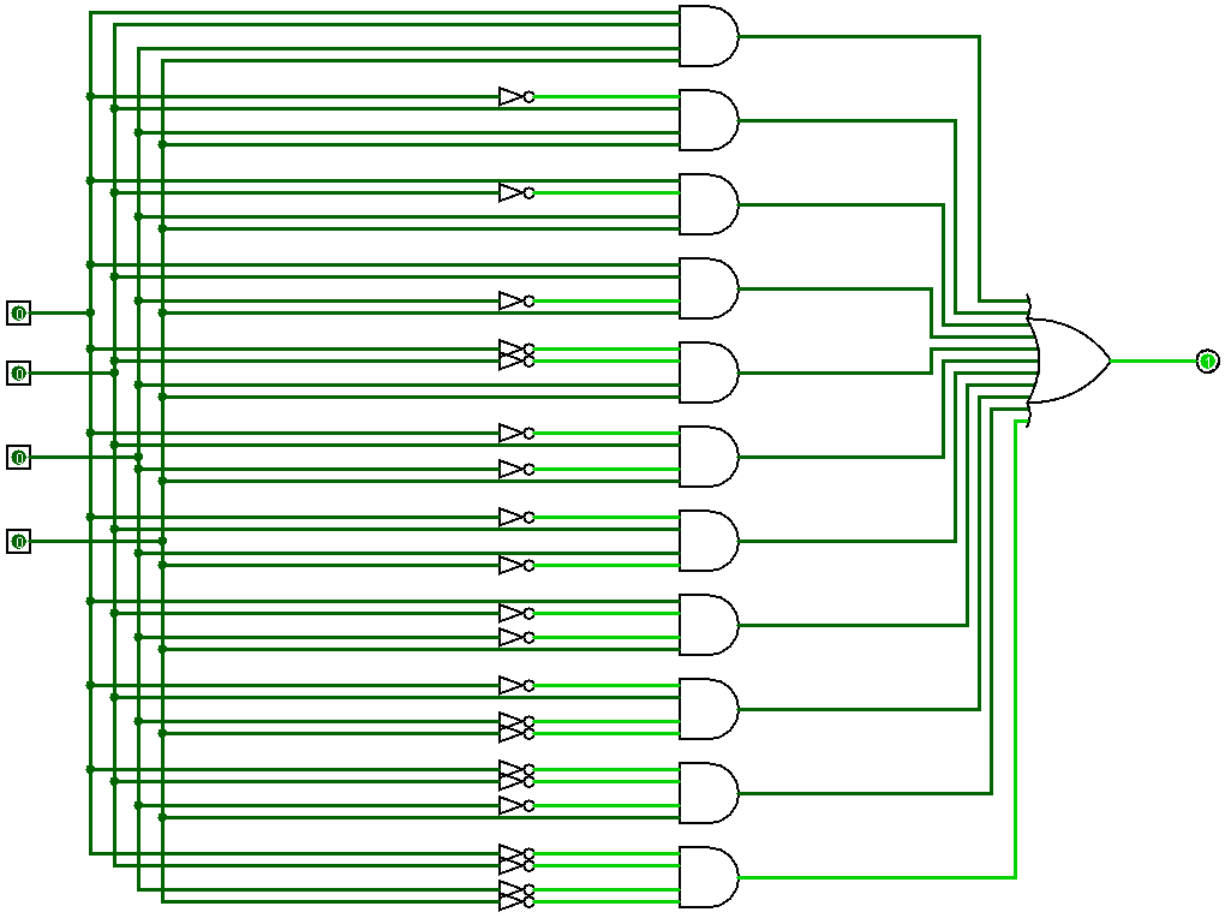

Figure 1: Basic gates realisation of SOP form

## NAND Gate realisation

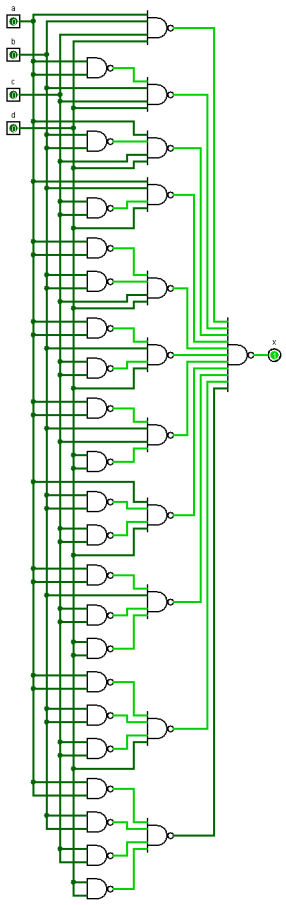

Figure 2: NAND Gate realisation of SOP form

Expression for NAND gate realisation

# Canonical POS form

Given Equation: $\bar{A} \cdot (B + \bar{C}) + D$
Canonical POS form:

$$(A+B+\bar{C}+D)\cdot(\bar{A}+B+C+D)\cdot(\bar{A}+B+\bar{C}+D)\cdot(\bar{A}+\bar{B}+C+D)\cdot(\bar{A}+\bar{B}+\bar{C}+D)$$

## Truth table

(Same obtained for both realisations of the circuit)

| a | b | c | d | x |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

## Simple gates realisation

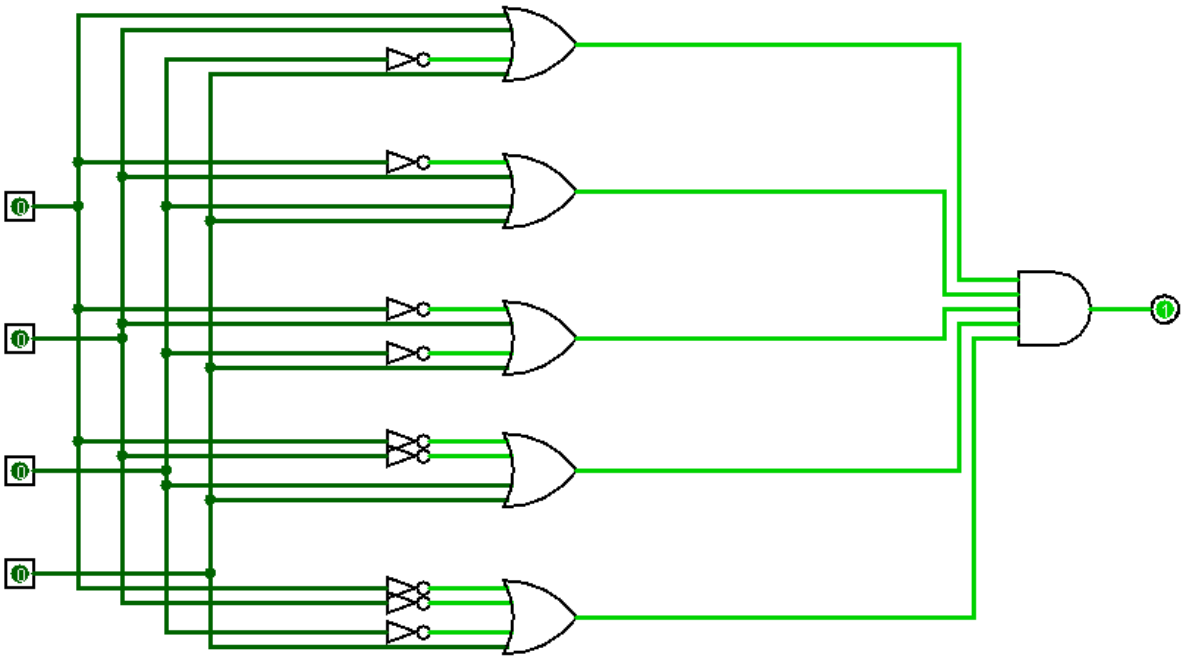

Figure 3: Basic gates realisation of POS form

## NOR Gate realisation

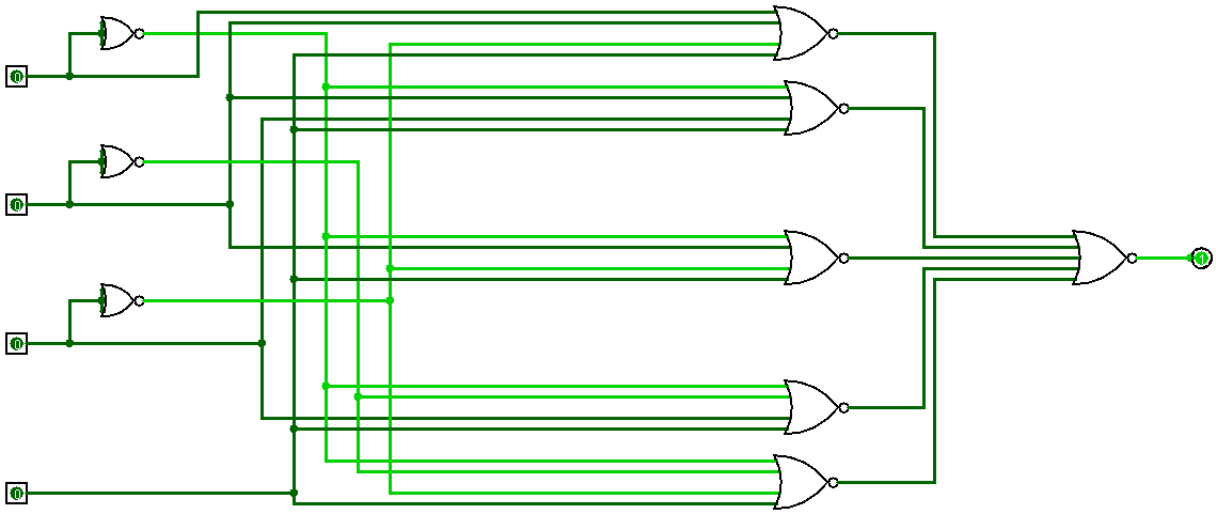

Figure 4: NOR Gate realisation of POS form

Expression for NOR gate realisation

$$\overline{\overline{a+b+\overline{c+c}+d}}\;\overline{\overline{a+a+b+c+d}}\;\overline{\overline{a+a+b+\overline{c+c}+d}}\;\overline{\overline{a+a+\overline{b+b}+c+d}}\;\overline{\overline{a+a+\overline{b+b}+\overline{c+c}+d}}$$