|  |  |
| --- | --- |
| essg | Escola Secundária de Sebastião da Gama |
| Sistemas Digitais e Arquitetura de Computadores – Módulo 3 |
| Ano 10º - Turma N |
| Prof. Carlos Pereira |



*Relatório da Experiência 7*

***Circuitos combinatórios***

**Descodificador para um display de 7 segmentos**

[**www.Ticmania.net**](http://www.Ticmania.net)

## Situação/problema

Este relatório terá como objetivo desenvolver um descodificador para um display de 7 segmentos.

## Tabela de verdade e Expressão booleana

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Pos.** | **8** | **4** | **2** | **1** | **7 segmentos** |
|  | **s3** | **S2** | **s1** | **s0** | **a** | **b** | **c** | **d** | **e** | **f** | **g** |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 3 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 4 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 5 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 6 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 7 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 8 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| 10 | x | x | x | X | x | x | x | x | x | x | X |
| 11 | X | x | x | x | x | x | x | x | x | x | X |
| 12 | x | x | x | X | x | x | x | x | x | x | X |
| 13 | x | x | x | x | x | x | x | x | x | x | X |
| 14 | x | x | x | x | x | x | x | x | x | x | X |
| 15 | x | x | x | x | x | x | x | x | x | x | X |

## Mapa de Karnaugh

**Segmento a**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CD | $$\overline{C} \overline{D}$$ | $$\overline{C}D$$ | $$CD$$ | $$C\overline{D}$$ | Simplificação da Expressão booleana |
| AB |  | 00 | 01 | 11 | 10 |
| $$\overline{A} \overline{B}$$ | 00 | 1 | 0 | 0 | 1 | 1 | 3 | 1 | 2 | **A+C+BD+B’D’****A+C+** $\overbar{B⊕D}$ |
|  |  |  |  |
| $$\overline{A}B$$ | 01 | 0 | 4 | 1 | 5 | 1 | 7 | 1 | 6 |
|  |  |  |  |
| $$AB$$ | 11 | X | 12 | X | 13 | X | 15 | X | 14 |
|  |  |  |  |
| $$A\overline{B}$$ | 10 | 1 | 8 | 1 | 9 | X | 11 | X | 10 |
|  |  |  |  |

**Segmento b**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CD | $$\overline{C} \overline{D}$$ | $$\overline{C}D$$ | $$CD$$ | $$C\overline{D}$$ | Simplificação da Expressão booleana |
| AB |  | 00 | 01 | 11 | 10 |
| $$\overline{A} \overline{B}$$ | 00 | 1 | 0 | 1 | 1 | 1 | 3 | 1 | 2 | **B’+C’D’+CD****B’+** $\overbar{C⊕D}$ |
|  |  |  |  |
| $$\overline{A}B$$ | 01 | 1 | 4 | 0 | 5 | 1 | 7 | 0 | 6 |
|  |  |  |  |
| $$AB$$ | 11 | X | 12 | X | 13 | X | 15 | X | 14 |
|  |  |  |  |
| $$A\overline{B}$$ | 10 | 1 | 8 | 1 | 9 | X | 11 | X | 10 |
|  |  |  |  |

**Segmento c**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CD | $$\overline{C} \overline{D}$$ | $$\overline{C}D$$ | $$CD$$ | $$C\overline{D}$$ | Simplificação da Expressão booleana |
| AB |  | 00 | 01 | 11 | 10 |
| $$\overline{A} \overline{B}$$ | 00 | 1 | 0 | 1 | 1 | 1 | 3 | 0 | 2 | **C’+D+B** |
|  |  |  |  |
| $$\overline{A}B$$ | 01 | 1 | 4 | 1 | 5 | 1 | 7 | 1 | 6 |
|  |  |  |  |
| $$AB$$ | 11 | X | 12 | X | 13 | X | 15 | X | 14 |
|  |  |  |  |
| $$A\overline{B}$$ | 10 | 1 | 8 | 1 | 9 | X | 11 | X | 10 |
|  |  |  |  |

**Segmento d**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CD | $$\overline{C} \overline{D}$$ | $$\overline{C}D$$ | $$CD$$ | $$C\overline{D}$$ | Simplificação da Expressão booleana |
| AB |  | 00 | 01 | 11 | 10 |
| $$\overline{A} \overline{B}$$ | 00 | 1 | 0 | 0 | 1 | 1 | 3 | 1 | 2 | **A+B’D’+CB’+CD’+BC’D** |
|  |  |  |  |
| $$\overline{A}B$$ | 01 | 0 | 4 | 1 | 5 | 0 | 7 | 1 | 6 |
|  |  |  |  |
| $$AB$$ | 11 | X | 12 | X | 13 | X | 15 | X | 14 |
|  |  |  |  |
| $$A\overline{B}$$ | 10 | 1 | 8 | 1 | 9 | X | 11 | X | 10 |
|  |  |  |  |

**Segmento e**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CD | $$\overline{C} \overline{D}$$ | $$\overline{C}D$$ | $$CD$$ | $$C\overline{D}$$ | Simplificação da Expressão booleana |
| AB |  | 00 | 01 | 11 | 10 |
| $$\overline{A} \overline{B}$$ | 00 | 1 | 0 | 0 | 1 | 0 | 3 | 1 | 2 | **B’D’+CD’** |
|  |  |  |  |
| $$\overline{A}B$$ | 01 | 0 | 4 | 0 | 5 | 0 | 7 | 1 | 6 |
|  |  |  |  |
| $$AB$$ | 11 | X | 12 | X | 13 | X | 15 | X | 14 |
|  |  |  |  |
| $$A\overline{B}$$ | 10 | 1 | 8 | 0 | 9 | X | 11 | X | 10 |
|  |  |  |  |

**Segmento f**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CD | $$\overline{C} \overline{D}$$ | $$\overline{C}D$$ | $$CD$$ | $$C\overline{D}$$ | Simplificação da Expressão booleana |
| AB |  | 00 | 01 | 11 | 10 |
| $$\overline{A} \overline{B}$$ | 00 | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 2 | **A+C’D’+BC’+BD’** |
|  |  |  |  |
| $$\overline{A}B$$ | 01 | 1 | 4 | 1 | 5 | 0 | 7 | 1 | 6 |
|  |  |  |  |
| $$AB$$ | 11 | X | 12 | X | 13 | X | 15 | X | 14 |
|  |  |  |  |
| $$A\overline{B}$$ | 10 | 1 | 8 | 1 | 9 | X | 11 | X | 10 |
|  |  |  |  |

**Segmento g**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CD | $$\overline{C} \overline{D}$$ | $$\overline{C}D$$ | $$CD$$ | $$C\overline{D}$$ | Simplificação da Expressão booleana |
| AB |  | 00 | 01 | 11 | 10 |
| $$\overline{A} \overline{B}$$ | 00 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 2 | **A+CD’+BC’+B’C****A+CD’+** $\overbar{B⊕C}$ |
|  |  |  |  |
| $$\overline{A}B$$ | 01 | 1 | 4 | 1 | 5 | 0 | 7 | 1 | 6 |
|  |  |  |  |
| $$AB$$ | 11 | X | 12 | X | 13 | X | 15 | X | 14 |
|  |  |  |  |
| $$A\overline{B}$$ | 10 | 1 | 8 | 1 | 9 | X | 11 | X | 10 |
|  |  |  |  |

## Circuito lógico

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