ECM245 - Arquitetura e Organização de Computadores  
Trabalho Semestral – Adição de duas instruções ao processador

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Maio de 2022

São Caetano do Sul

Tabela Verdade original:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| OP Code | Código Binário | Hex | SelUlaSrc | OP\_ULA | WR\_RAM | WR\_PC | \WR\_IR | WR\_ACC | SelAccSrc\_1 | SelAccSrc\_0 |
| HLT | 0000b | 0x0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| STO | 0001b | 0x1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| LD | 0010b | 0x2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| LDI | 0011b | 0x3 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| ADD | 0100b | 0x4 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| ADDI | 0101b | 0x5 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| SUB | 0110b | 0x6 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| SUBI | 0111b | 0x7 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| Reservado | 1000b | 0x8 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1001b | 0x9 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1010b | 0xA | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1011b | 0xB | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1100b | 0xC | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1101b | 0xD | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1110b | 0xE | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1111b | 0xF | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |

Modificação realizada para implementação das funções:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| OP Code | Código Binário | Hex | SelUlaSrc | OP\_ULA | WR\_RAM | WR\_PC | \WR\_IR | WR\_ACC | SelAccSrc\_1 | SelAccSrc\_0 |
| HLT | 0000b | 0x0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| STO | 0001b | 0x1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| LD | 0010b | 0x2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| LDI | 0011b | 0x3 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| ADD | 0100b | 0x4 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| ADDI | 0101b | 0x5 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| SUB | 0110b | 0x6 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| SUBI | 0111b | 0x7 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| JUMP | 1000b | 0x8 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| NOP | 1001b | 0x9 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Reservado | 1010b | 0xA | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1011b | 0xB | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1100b | 0xC | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1101b | 0xD | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1110b | 0xE | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Reservado | 1111b | 0xF | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |

Reformulação da função e mapa de Karnaugh:

|  |  |  |
| --- | --- | --- |
| OP Code | D15 D14 D13 D12 | \WR\_IR |
| HLT | 0000b | 0 |
| STO | 0001b | 0 |
| LD | 0010b | 0 |
| LDI | 0011b | 0 |
| ADD | 0100b | 0 |
| ADDI | 0101b | 0 |
| SUB | 0110b | 0 |
| SUBI | 0111b | 0 |
| JUMP | 1000b | 1 |
| NOP | 1001b | 0 |
| Reservado | 1010b | 0 |
| Reservado | 1011b | 0 |
| Reservado | 1100b | 0 |
| Reservado | 1101b | 0 |
| Reservado | 1110b | 0 |
| Reservado | 1111b | 0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| D13 D12  D15 D14 | 00 | 01 | 10 | 11 |
| 00 | 0 | 0 | 0 | 0 |
| 01 | 0 | 0 | 0 | 0 |
| 10 | 1 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 |