Instituto Tecnológico de Aeronáutica

Divisão de Ciência da Computação - IEC

Departamento de Sistemas de Computação - IEC-SC

EEA-25 - Sistemas Digitais Programáveis

Lista de Exercícios Nº 4

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Sumário

1 Exercise 1 (1,0)

Convert the following expressions to sum-of-product (SOP) forms:

A $(C+D)(A+\overline{D})$

B $A(A\overline{D}+C)$

C $(A+C)(CD+AC)$

2 Exercise 2 (1,0)

Develop a truth table for each of the following standard SOP expressions:

A $ABC+\overline{A}\overline{B}C+AB\overline{C}$

B $\overline{X}\overline{Y}\overline{Z}+\overline{X}Y\overline{Z}+X\overline{Y}Z+\overline{X}YZ+XY\overline{Z}$

3 Exercise 3 (1,0)

Develop a truth table for each of the standard POS expressions:

A $(A+B)(A+C)(A+B+C)$

B $(A+\overline{B})(A+\overline{B}+\overline{C})(B+C+\overline{D})(\overline{A}+B+\overline{C}+D)$

4 Exercise 4 (1,0)

Use a Karnaugh map to simplify each expression to a minimum SOP form:

A $\overline{A}\overline{B}\overline{C}+A\overline{B}C+\overline{A}BC+AB\overline{C}$

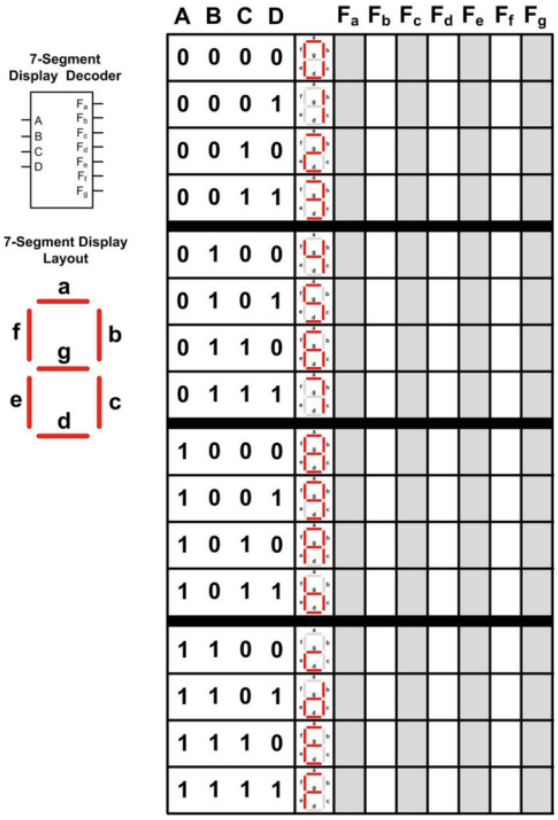
B $AC[\overline{B}+B(B+\overline{C})]$

C $DE\overline{F}+\overline{D}E\overline{F}+\overline{D}\overline{E}\overline{F}$

5 Exercise 5 (6,0)

Design a 4-input, 7-segment HEX character decoder by hand. The system has four inputs called A, B, C, and D. The system has seven outputs called Fa, Fb, Fc, Fd, Fe, Ff, and Fg. These outputs drive the individual LEDs within the display. A logic 1 on an output corresponds to the LED being ON. The display will show the HEX characters 0–9, A, b, c, d, E, and F corresponding to the 4-bit input code on A.

Figure 1 shows the truth table of the 7-segment display decoder:



A	B	C	D	F_a	F_b	F_c	F_d	F_e	F_f	F_g
0	0	0	0							
0	0	0	1							
0	0	1	0							
0	0	1	1							
0	1	0	0							
0	1	0	1							
0	1	1	0							
0	1	1	1							
1	0	0	0							
1	0	0	1							
1	0	1	0							
1	0	1	1							
1	1	0	0							
1	1	0	1							
1	1	1	0							
1	1	1	1							

Figura 1: 7-segment display decoder truth table.

A template for creating the truth tables for this system is provided as follows:

```
module decoder_7seg_4din
(output wire [6:0] F, input wire [3:0] ABCD);
```