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R.A: 14.04014 - 0

Exercício 1:

Exercício 2:

Exercício 3:

Variáveis de decisão

$P_i = \text{CARGA no Ponto } i \quad (i = 1, 2, 3, 4, 5)$

$T_j = \text{TENSÃO no CABO } j \quad (j = 1, 2, 3, 4)$

Função objetivo

$$\text{Max } z = \sum_{i=1}^5 P_i$$

Restrições

$$0,75 P_1 + 0,5 P_2 + 0,25 P_3 = T_1$$

$$0,25 P_1 + 0,5 P_2 + 0,75 P_3 = T_2$$

$$0,75 P_3 + 0,5 P_4 + 0,25 P_5 = T_3$$

$$0,25 P_3 + 0,5 P_4 + 0,75 P_5 = T_4$$

$$T_1 \leq 100$$

$$T_2 \leq 300$$

$$T_3 \leq 250$$

$$T_4 \leq 200$$

$$P_i, T_j \geq 0$$

Exercício 4:

$$\text{Min} Z - 3x_1 - 5x_2 = 0$$

$$3x_1 + 2x_2 + s_1 = 36$$

$$3x_1 + 5x_2 + 0 + s_2 = 45$$

Z	x_1	x_2	s_1	s_2	b
1	-3	-5	0	0	0
0	3	2	1	0	36
Sai -	0	3	5	0	45

$\frac{36}{2} = 18$

$\frac{45}{5} = 15$

$$\begin{array}{cccccc} \text{NLP:} & 0 & 3 & 5 & 0 & 1 & 45 \\ (\div 5) & 0 & 0,6 & 1 & 0 & 0,2 & 15 \end{array}$$

$$\begin{array}{ccccccc} NL_1: & 0 & 0,6 & 1 & 0 & 0,2 & 15 \\ \times 5: & 0 & 3 & 5 & 0 & 1 & 45 \\ + L_1: & \underline{1} & \underline{-3} & \underline{-5} & \underline{0} & \underline{0} & \underline{0} \\ & 1 & 0 & 0 & 0 & 1 & 45 \end{array}$$

$$\begin{array}{ccccccc} NL_2: & 0 & 0,6 & 1 & 0 & 0,2 & 15 \\ \times (-2): & 0 & -1,2 & -2 & 0 & -0,4 & -30 \\ + L_2: & \underline{0} & \underline{3} & \underline{2} & \underline{1} & \underline{0} & \underline{36} \\ & 0 & 1,8 & 0 & 1 & -0,4 & 6 \end{array}$$

Nova tabela:

Z	x_1	x_2	s_1	s_2	b
1	0	0	0	1	45
0	1,8	0	1	-0,4	6
0	0,6	1	0	0,2	15

Resposta: $Z = 45$

$x_1 = 0$

$x_2 = 15$

Exercício 5:

$$z - x_1 + x_2 = 0$$

$$x_1 + x_2 + s_1 = 6$$

$$x_1 - x_2 + 0 + s_2 = 0$$

$$-x_1 + x_2 + 0 + 0 + s_3 = 3$$

↙ Entre

z	x_1	x_2	s_1	s_2	s_3	b
1	-1	1	0	0	0	0
0	1	1	1	0	0	6
Sai: $\leftarrow 0$	0	1	0	1	0	0
	0	-1	1	0	1	3

$\cancel{1}/1 = \cancel{6}$

$\cancel{0}/1 = 0$

$3/1 = -3$

$$NL_P: 0 \ 1 \ -1 \ 0 \ 1 \ 0 \ 0$$

$$\div 1: 0 \ 1 \ -1 \ 0 \ 1 \ 0 \ 0$$

$$NL_I: 0 \ 1 \ -1 \ 0 \ 1 \ 0 \ 0$$

$$x(1): 0 \ 1 \ -1 \ 0 \ 1 \ 0 \ 0$$

$$+ L_1: 1 \ -1 \ 1 \ 0 \ 0 \ 0 \ 0$$

$$\underline{1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0}$$

$$NL_2: 0 \ 1 \ -1 \ 0 \ 1 \ 0 \ 0$$

$$x(-1): 0 \ -1 \ 1 \ 0 \ -1 \ 0 \ 0$$

$$\begin{array}{r} + L_2: \quad 0 \ 1 \ 1 \ 1 \ 0 \ 0 \ 6 \\ \hline 0 \ 0 \ 2 \ 1 \ -1 \ 0 \ 6 \end{array}$$

$$N\lambda_4: \quad 0 \ 1 \ -1 \ 0 \ 1 \ 0 \ 0$$

$$x(1): \quad 0 \ 1 \ -1 \ 0 \ 1 \ 0 \ 0$$

$$\begin{array}{r} + L_4: \quad 0 \ -1 \ 1 \ 0 \ 0 \ 1 \ 3 \\ \hline 0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 3 \end{array}$$

Nova tabela:

Z	x_1	x_2	s_1	s_2	s_3	b
1	0	0	0	1	0	0
	0	0	2	1	-1	0
	0	1	-1	0	1	0
	0	0	0	0	1	1
						3

Resposta: $Z = 0$
 $x_1 = 0$
 $x_2 = 0$

Exercício 6:

$$\max z = 2x_1 + x_2 - x_3 = 0$$

$$3x_1 + 2x_2 + x_3 + s_1 = 60$$

$$x_1 - x_2 + 2x_3 + 0 + s_2 = 10$$

$$x_1 + x_2 - x_3 + 0 + 0 + s_3 = 20$$

↓ Entrada

z	x_1	x_2	x_3	s_1	s_2	s_3	b
1	-2	1	-1	0	0	0	0
0	3	2	1	1	0	0	$60 = \frac{60}{3} = 20$
Sai $\leftarrow 0$	1	-1	2	0	1	0	$10 = \frac{10}{1} = 10$
0	1	1	-1	0	0	1	$20 = 20 \cdot 1 = 20$

$$NLP: 0 \ 1 \ -1 \ 2 \ 0 \ 1 \ 0 \ 10$$

$$(\div 1): 0 \ 1 \ -1 \ 2 \ 0 \ 1 \ 0 \ 10$$

$$NL1: 0 \ 1 \ -1 \ 2 \ 0 \ 1 \ 0 \ 10$$

$$(x_2): 0 \ 2 \ -2 \ 4 \ 0 \ 2 \ 0 \ 20$$

$$+ L1: \underline{\underline{1 \ -2 \ 1 \ -1 \ 0 \ 0 \ 0 \ 0}}$$

$$1 \ 0 \ -1 \ 3 \ 0 \ 2 \ 0 \ 20$$

$$NL2: 0 \ 1 \ -1 \ 2 \ 0 \ 1 \ 0 \ 10$$

$$x(-3): 0 \ -3 \ 3 \ -6 \ 0 \ -3 \ 0 \ -30$$

$$+ L_2: \begin{array}{ccccccc} & 0 & 3 & 2 & 1 & 1 & 0 & 0 & 60 \\ \hline & 0 & 0 & 5 & -5 & 1 & -3 & 0 & 30 \end{array}$$

$$NL_4: \begin{array}{ccccccccc} 0 & 1 & -1 & 2 & 0 & 1 & 0 & 10 \end{array}$$

$$\times(-1): \begin{array}{ccccccccc} 0 & -1 & 1 & -2 & 0 & -1 & 0 & -10 \end{array}$$

$$+ L_4: \begin{array}{ccccccc} & 0 & 1 & 1 & -1 & 0 & 0 & 1 & 20 \\ \hline & 0 & 0 & 2 & -3 & 0 & -1 & 1 & 10 \end{array}$$

Nova tabela:

✓ Entrar

Z	x_1	x_2	x_3	s_1	s_2	s_3	b
1	0	-1	3	0	2	0	20
0	0	5	-5	1	-3	0	30
0	1	-1	2	0	1	0	10
Sai: ←	0	0	2	-3	0	-1	10

$$NL_P: \begin{array}{ccccccccc} 0 & 0 & 2 & -3 & 0 & -1 & 1 & 10 \end{array}$$

$$(\div 2): \begin{array}{ccccccccc} 0 & 0 & 1 & -1,5 & 0 & -0,5 & 0,5 & 5 \end{array}$$

$$NL_1: \begin{array}{ccccccccc} 0 & 0 & 1 & -1,5 & 0 & -0,5 & 0,5 & 5 \end{array}$$

$$(x_1): \begin{array}{ccccccccc} 0 & 0 & 1 & -1,5 & 0 & -0,5 & 0,5 & 5 \end{array}$$

$$+ L_1: \begin{array}{ccccccc} & 1 & 0 & -1 & 3 & 0 & 2 & 0 & 20 \\ \hline & 1 & 0 & 0 & 1,5 & 0 & 1,5 & 0,5 & 25 \end{array}$$

$$NL: \begin{array}{ccccccccc} 0 & 0 & 1 & -1,5 & 0 & -0,5 & 0,5 & 5 \end{array}$$

$$\begin{array}{r}
 x(-5) \quad 0 \quad 0 \quad -5 \quad 7,5 \quad 0 \quad 2,5 \quad -2,5 \quad -25 \\
 + L_2: \quad 0 \quad 0 \quad 5 \quad -3 \quad 1 \quad -3 \quad 0 \quad 30 \\
 \hline
 0 \quad 0 \quad 0 \quad 2,5 \quad 1 \quad -0,5 \quad -2,5 \quad 5
 \end{array}$$

$$\begin{array}{r}
 NL_3: \quad 0 \quad 0 \quad 1 \quad -1,5 \quad 0 \quad -0,5 \quad 0,5 \quad 5 \\
 x(1): \quad 0 \quad 0 \quad 1 \quad -1,5 \quad 0 \quad -0,5 \quad 0,5 \quad 5 \\
 + L_3: \quad 0 \quad 1 \quad -1 \quad 2 \quad 0 \quad 1 \quad 0 \quad 10 \\
 \hline
 0 \quad 1 \quad 0 \quad 0,5 \quad 0 \quad 0,5 \quad 0,5 \quad 15
 \end{array}$$

Nova tabela:

Z	x_1	x_2	x_3	s_1	s_2	s_3	b
1	0	0	1,5	0	1,5	0,5	25
0	0	0	2,5	1	-0,5	-25	5
0	1	0	0,5	0	0,5	0,5	15
0	0	1	-1,5	0	-0,5	0,5	5

R: $Z = 25$
 $x_1 = 15$
 $x_2 = 5$
 $x_3 = 0$

Exercício 7:

$$\max z - 4x_1 - 3x_2 = 0$$

$$x_1 + 3x_2 + s_1 = 7$$

$$2x_1 + 2x_2 + 0 + s_2 = 8$$

$$x_1 + x_2 + 0 + 0 + s_3 = 3$$

$$0 + x_2 + 0 + 0 + 0 + s_4 = 2$$

↙ Entrada

z	x_1	x_2	s_1	s_2	s_3	s_4	b
1	-4	-3	0	0	0	0	0
0	1	3	1	0	0	0	7 $\frac{7}{1} = 7$
0	2	2	0	1	0	0	8 $\frac{8}{2} = 4$
0	1	1	0	0	1	0	3 $\frac{3}{1} = 3$
0	0	0	0	0	0	1	2 $\frac{2}{1} = 2$

$$Nb_p: \quad 0 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 2$$

$$\div 1 : \quad 0 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 2$$

$$Nb_1: \quad 0 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 2$$

$$x(4) \quad 0 \quad 4 \quad 0 \quad 0 \quad 0 \quad 0 \quad 4 \quad 8$$

$$+ b_1: \quad 1 \quad -4 \quad -3 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$$

$$\underline{1 \quad 0 \quad -3 \quad 0 \quad 0 \quad 0 \quad 0 \quad 4 \quad 8}$$

$$\begin{array}{l}
 \text{Nb}_2: \begin{matrix} 0 & 1 & 0 & 0 & 0 & 0 & 1 & 2 \end{matrix} \\
 \times(-1): \begin{matrix} 0 & -1 & 0 & 0 & 0 & 0 & -1 & -2 \end{matrix} \\
 + L_2: \begin{matrix} 0 & 1 & 3 & 1 & 0 & 0 & 0 & 7 \end{matrix} \\
 \hline
 \begin{matrix} 0 & 0 & 3 & 1 & 0 & 0 & -1 & 5 \end{matrix}
 \end{array}$$

$$\begin{array}{l}
 \text{NL}_3: \begin{matrix} 0 & 1 & 0 & 0 & 0 & 0 & 1 & 2 \end{matrix} \\
 \times(-2): \begin{matrix} 0 & -2 & 0 & 0 & 0 & 0 & -2 & -4 \end{matrix} \\
 + L_3: \begin{matrix} 0 & 2 & 2 & 0 & 1 & 0 & 0 & 8 \end{matrix} \\
 \hline
 \begin{matrix} 0 & 0 & 2 & 0 & 1 & 0 & -2 & 4 \end{matrix}
 \end{array}$$

$$\begin{array}{l}
 \text{NL}_4: \begin{matrix} 0 & 1 & 0 & 0 & 0 & 0 & 1 & 2 \end{matrix} \\
 \times(-1): \begin{matrix} 0 & -1 & 0 & 0 & 0 & 0 & -1 & -2 \end{matrix} \\
 + L_4: \begin{matrix} 0 & 1 & 1 & 0 & 0 & 1 & 0 & 3 \end{matrix} \\
 \hline
 \begin{matrix} 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \end{matrix}
 \end{array}$$

Nova Tabela:

\bar{x}	x_1	x_2	s_1	s_2	s_3	s_4	b
1	0	-3	0	0	0	4	8
0	0	3	1	0	0	-1	5
0	0	2	0	1	0	-2	4
Sai: ←	0	0	1	0	0	1	-1
	0	1	0	0	0	1	2

↙ Entrada

$5/3 = 1,667$

$4/2 = 2$

$1/1 = 1$

$2/0 = \text{N.A}$

$$\text{Nb}_0: \begin{matrix} 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \end{matrix}$$

$$\div \begin{matrix} 1 & 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \end{matrix}$$

$$NL_1: \begin{matrix} 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \end{matrix}$$

$$x_3: \begin{matrix} 0 & 0 & 3 & 0 & 0 & 3 & -3 & 3 \end{matrix}$$

$$\underline{+ L_1: \begin{matrix} 1 & 0 & -3 & 0 & 0 & 0 & 4 & 8 \end{matrix}}$$

$$\begin{matrix} 1 & 0 & 0 & 0 & 0 & 3 & 1 & 11 \end{matrix}$$

$$NL_2: \begin{matrix} 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \end{matrix}$$

$$x(-3): \begin{matrix} 0 & 0 & -3 & 0 & 0 & -3 & 3 & -3 \end{matrix}$$

$$\underline{+ L_2: \begin{matrix} 0 & 0 & 3 & 1 & 0 & 0 & -1 & 5 \end{matrix}}$$

$$\begin{matrix} 0 & 0 & 0 & 1 & 0 & -3 & 2 & 2 \end{matrix}$$

$$NL_3: \begin{matrix} 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \end{matrix}$$

$$x(-2): \begin{matrix} 0 & 0 & -2 & 0 & 0 & -2 & 2 & -2 \end{matrix}$$

$$\underline{+ L_3: \begin{matrix} 0 & 0 & 2 & 0 & 1 & 0 & -2 & 4 \end{matrix}}$$

$$\begin{matrix} 0 & 0 & 0 & 0 & 1 & -2 & 0 & 2 \end{matrix}$$

$$NL_5: \begin{matrix} 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \end{matrix}$$

$$x(0): \begin{matrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{matrix}$$

$$\underline{+ L_5: \begin{matrix} 0 & 1 & 0 & 0 & 0 & 0 & 1 & 2 \end{matrix}}$$

$$\begin{matrix} 0 & 1 & 0 & 0 & 0 & 0 & 1 & 2 \end{matrix}$$

Nova tabela:

x	x_1	x_2	s_1	s_2	s_3	s_4	b
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$$\begin{array}{ccccccccc}
 1 & 0 & 0 & 0 & 0 & 3 & 1 & 11 \\
 0 & 0 & 0 & 1 & 0 & -3 & 2 & 2 \\
 0 & 0 & 0 & 0 & 1 & -2 & 0 & 2 \\
 0 & 0 & 1 & 0 & 0 & 1 & -1 & 1 \\
 0 & 1 & 0 & 0 & 0 & 0 & 1 & 2
 \end{array}$$

$R: z = 11$
 $x_1 = 2$
 $x_2 = 1$