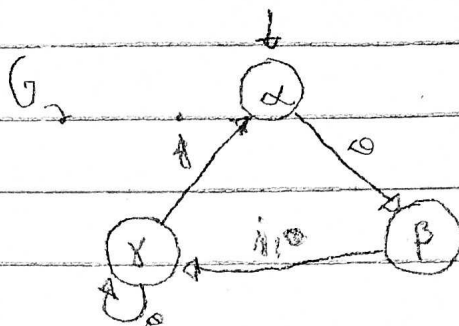
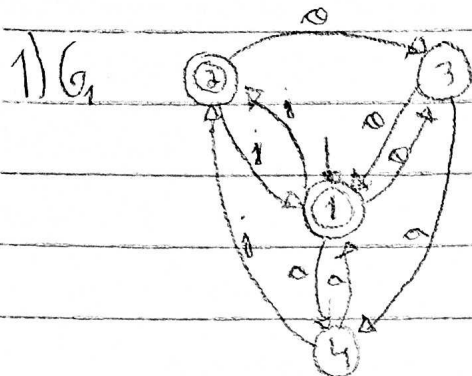


# Lista 1b - Control para automação

$$E = \{j, \emptyset, a, v, i, k, t, n\}$$



$$\emptyset, 1, (1, \alpha), (1, \beta), (1, \gamma), (2, \alpha), (2, \beta), (2, \gamma), (3, \alpha), (3, \beta), (3, \gamma), (4, \alpha), (4, \beta), (4, \gamma)$$

$$2.1) \Gamma_1(1) \cap \Gamma_2(\alpha) = \{\emptyset\} \quad \Gamma_1(2) \cap \Gamma_2(\alpha) = \{\emptyset\} \quad \Gamma_1(3) \cap \Gamma_2(\alpha) = \{\emptyset\}$$

$$\Gamma_1(1) \cap \Gamma_2(\beta) = \{i, \emptyset\} \quad \Gamma_1(2) \cap \Gamma_2(\beta) = \{i, \emptyset\} \quad \Gamma_1(3) \cap \Gamma_2(\beta) = \{\emptyset\}$$

$$\Gamma_1(1) \cap \Gamma_2(\gamma) = \{j, \emptyset\} \quad \Gamma_1(2) \cap \Gamma_2(\gamma) = \{j, \emptyset\} \quad \Gamma_1(3) \cap \Gamma_2(\gamma) = \{\emptyset\}$$

$$\Gamma_1(4) \cap \Gamma_2(\alpha) = n.d$$

$$\Gamma_1(4) \cap \Gamma_2(\beta) = \{i\}$$

$$\Gamma_1(4) \cap \Gamma_2(\gamma) = \{j\}$$

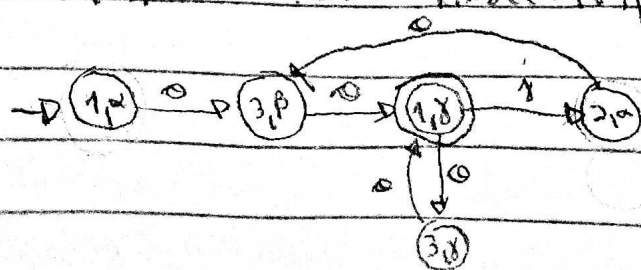
$$2.2) f_{1x2}((1, \alpha), \emptyset) = (3, \beta) \vee f_{1x2}((2, \alpha), \emptyset) = (3, \beta) \vee f_{1x2}((3, \alpha), \emptyset) = (1, \beta)$$

$$f_{1x2}((1, \beta), j) = (2, \gamma) \quad f_{1x2}((2, \beta), j) = (1, \gamma) \quad f_{1x2}((3, \beta), \emptyset) = (1, \gamma) \vee$$

$$f_{1x2}((1, \beta), \emptyset) = (3, \gamma) \quad f_{1x2}((2, \beta), \emptyset) = (3, \gamma) \quad f_{1x2}((3, \gamma), \emptyset) = (1, \gamma) \vee$$

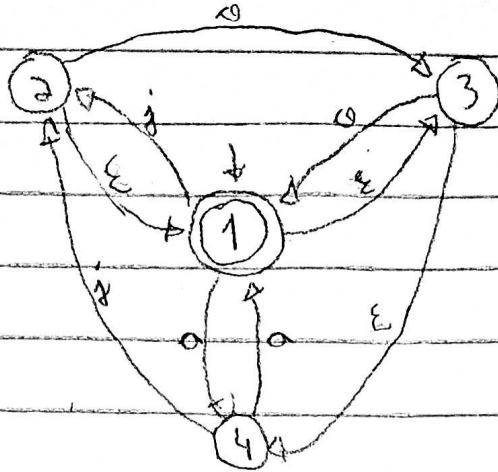
$$f_{1x2}((1, \gamma), i) = (2, \alpha) \vee f_{1x2}((2, \gamma), i) = (1, \alpha) \quad f_{1x2}((4, \beta), j) = (2, \gamma)$$

$$f_{1x2}((1, \gamma), \emptyset) = (3, \gamma) \vee f_{1x2}((2, \gamma), \emptyset) = (3, \gamma) \quad f_{1x2}((4, \gamma), j) = (2, \alpha)$$





2)



$\delta(1, a)$   
 $\delta(3, a)$   
 $\delta(2, i)$

$$1. \delta_{\text{old}} = \epsilon R(1) = \{1, 3, 4\}$$

$$2. \delta_{\text{old}}(\{1, 3, 4\}, i) = \epsilon R\{2\} = \{1, 2, 3, 4\}$$

$$|\delta(1, i)| = 2$$

$$|\delta(3, i)| = \text{n.d.}$$

$$|\delta(4, i)| = 2$$

$$\delta_{\text{old}}(\{1, 3, 4\}, a) = \epsilon R(1) = \{1, 3, 4\}$$

$$|\delta(1, a)| = \text{n.d.}$$

$$|\delta(3, a)| = 1$$

$$|\delta(4, a)| = \text{n.d.}$$

$$\delta_{\text{old}}(\{1, 3, 4\}, a) = \epsilon R\{4, 1\} = \{1, 3, 4\}$$

$$|\delta(1, a)| = 4$$

$$|\delta(3, a)| = \text{n.d.}$$

$$|\delta(4, a)| = 1$$

$$3. \delta_{\text{old}}(\{1, 2, 3, 4\}, i) = \epsilon R(2) = \{1, 2, 3, 4\}$$

$$|\delta(1, i)| = 2$$

$$|\delta(3, i)| = \text{n.d.}$$

$$|\delta(4, i)| = 2$$

$$|\delta(2, i)| = \text{n.d.}$$

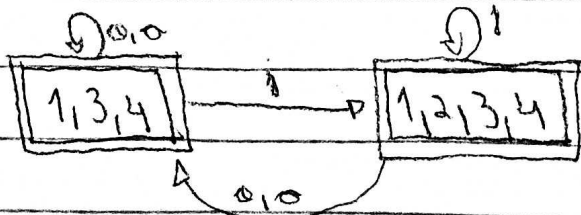
$$\delta_{\text{old}}(\{1, 2, 3, 4\}, a) = \epsilon R\{1, 3\} = \{1, 3, 4\}$$

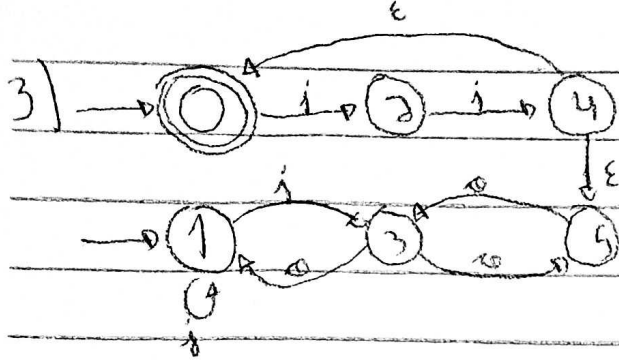
$$|\delta(3, a)| = 1$$

$$|\delta(2, a)| = 3$$

$$\delta_{\text{old}}(\{1, 2, 3, 4\}, a) = \epsilon R\{4, 1\} = \{1, 3, 4\}$$

$$|\delta(2, a)| = \text{n.d.}$$





1.  $x_0 = \epsilon R\{0,1\} = \{0,1\}$

$\text{hd}(\{0,1\}, 1) = \epsilon R\{1,2,3\} = \{1,2,3\}$       $\text{hd}(\{0,1\}, 0) = \text{n.d.}$

$\text{hd}(0, 1) = \{2\}$

$\text{hd}(0, 0) = \text{n.d.}$

$\text{hd}(1, 1) = \{1,3\}$

$\text{hd}(1, 0) = \text{n.d.}$

2.  $\text{hd}(\{1,2,3\}, 1) = \epsilon R\{1,3,4\} = \{1,3,0,4,5\}$       $\text{hd}(\{1,2,3\}, 0) = \epsilon R\{1,5\} = \{1,5\}$

$\text{hd}(2, 1) = 4$

$\text{hd}(2, 0) = \text{n.d.}$

$\text{hd}(3, 1) = \text{n.d.}$

$\text{hd}(3, 0) = \{1,5\}$

3.  $\text{hd}(\{0,1,3,4,5\}, 1) = \{1,2,3\}$

$\text{hd}(\{0,1,3,4,5\}, 0) = \epsilon R\{1,3,5\} = \{1,3,5\}$

$\text{hd}(4, 1) = \text{n.d.}$

$\text{hd}(4, 0) = \text{n.d.}$

$\text{hd}(5, 1) = \text{n.d.}$

$\text{hd}(5, 0) = 3$

4.  $\text{hd}(\{1,5\}, 1) = \epsilon R\{1,3\} = \{1,3\}$

$\text{hd}(\{1,5\}, 0) = \epsilon R\{3\} = \{3\}$

5.  $\text{hd}(\{1,3,5\}, 1) = \epsilon R\{1,3\} = \{1,3\}$

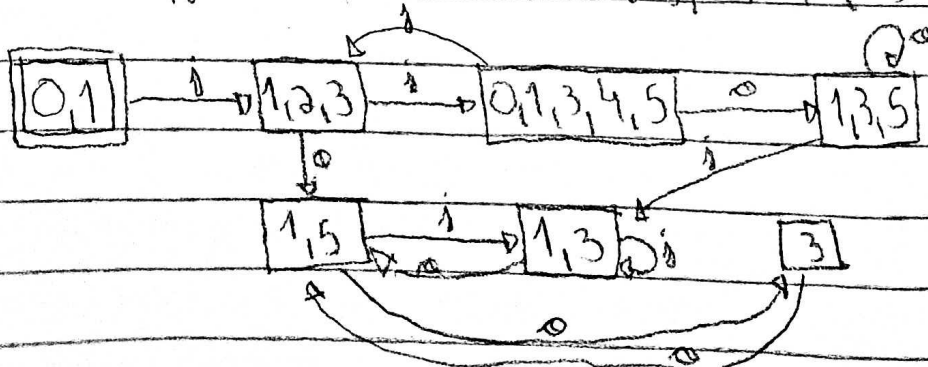
$\text{hd}(\{1,3,5\}, 0) = \epsilon R\{1,3,5\} = \{1,3,5\}$

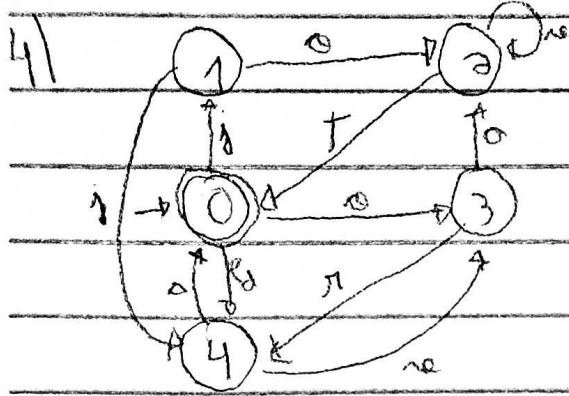
6.  $\text{hd}(\{1,3\}, 1) = \{1,3\}$

$\text{hd}(\{1,3\}, 0) = \{1,5\}$

7.  $\text{hd}(\{3\}, 1) = \text{n.d.}$

$\text{hd}(\{3\}, 0) = \{1,5\}$





$$E_0 = \{i, o, a, u\}$$

$$E_{u0} = \{e, t, y\}$$

$$a/x_0 = UR(\{0\}) = \{0, 4\}$$

$$1. \text{fch}(\{0, 4\}, i) = UR(\{1\}) = \{1\} \quad \text{fch}(\{0, 4\}, o) = UR(\{3\}) = \{3, 4\}$$

$$\text{fch}(0, i) = 1$$

$$\text{fch}(0, o) = 3$$

$$\text{fch}(4, i) = n.d$$

$$\text{fch}(4, o) = n.d$$

$$\text{fch}(\{0, 4\}, a) = UR(\{0\}) = \{0, 4\} \quad \text{fch}(\{0, 4\}, u) = UR(\{3\}) = \{3, 4\}$$

$$2. \text{fch}(\{1\}, i) = UR(\{4\}) = \{4\} \quad \text{fch}(\{1\}, o) = UR(\{2\}) = \{2, 0, 4\}$$

$$3. \text{fch}(\{3, 4\}, a) = UR(\{0, 2\}) = \{0, 2, 4\} \quad \text{fch}(\{3, 4\}, u) = UR(\{3\}) = \{3, 4\}$$

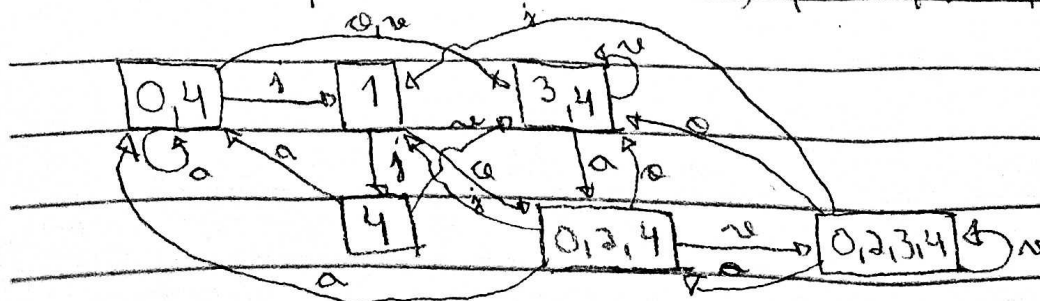
$$4. \text{fch}(\{4\}, a) = \{0, 4\} \quad \text{fch}(\{4\}, u) = \{3, 4\}$$

$$5. \text{fch}(\{0, 2, 4\}, a) = UR(\{3\}) = \{3, 4\} \quad \text{fch}(\{0, 2, 4\}, i) = UR(\{1\}) = \{1\}$$

$$\text{fch}(\{0, 2, 4\}, o) = UR(\{0\}) = \{0, 4\} \quad \text{fch}(\{0, 2, 4\}, u) = UR(\{3, 2\}) = \{0, 2, 3, 4\}$$

$$6. \text{fch}(\{0, 2, 3, 4\}, i) = UR(\{1\}) = \{1\} \quad \text{fch}(\{0, 2, 3, 4\}, a) = UR(\{3\}) = \{3, 4\}$$

$$\text{fch}(\{0, 2, 3, 4\}, o) = UR(\{2, 0\}) = \{0, 2, 4\} \quad \text{fch}(\{0, 2, 3, 4\}, u) = UR(\{2, 3\}) = \{0, 2, 3, 4\}$$





$$b) x_0 = UR(\{0\}) = (0N, 4Y) \vee$$

$$1. \text{diag}(\{0N, 4Y\}, i) = UR(\{1\}) = \{1N\} \vee \text{diag}(\{0N, 4Y\}, o) = UR(\{3\}) = \{3N, 4N\} \vee$$

$$\text{diag}(\{0, 4\}, a) = UR(\{0\}) = \{0N, 4Y\} \vee \text{diag}(\{0, 4\}, u) = UR(\{3\}) = \{3Y, 4Y\} \vee$$

$$2. \text{diag}(\{1N\}, i) = UR(\{4\}) = \{4N\} \vee \text{diag}(\{1N\}, o) = UR(\{2\}) = \{2N, 0N, 4Y\} \vee$$

$$3. \text{diag}(\{3N, 4N\}, a) = UR(\{0, 2\}) = \{0N, 2N, 4Y\} \vee \text{diag}(\{3N, 4N\}, u) = \{3N, 4N\}$$

$$4. \text{diag}(\{4N\}, a) = UR(\{0\}) = \{0N, 4Y\} \vee \text{diag}(\{4N\}, u) = UR(\{3\}) = \{3N, 4N\} \vee$$

$$5. \text{diag}(\{0N, 2N, 4Y\}, i) = UR(\{1\}) = \{1N\} \vee \text{diag}(\{0N, 2N, 4Y\}, o) = UR(\{3\}) = \{3N, 4N\} \vee$$

$$\text{diag}(\{0N, 2N, 4Y\}, a) = UR(\{0\}) = \{0Y, 4Y\} \vee \text{diag}(\{0N, 2N, 4Y\}, u) = UR(\{3, 2\}) = \{0N, 2N, 3Y, 4Y\} \vee$$

$$6. \text{diag}(\{3Y, 4Y\}, a) = \{0Y, 2Y, 4Y\} \vee \text{diag}(\{3Y, 4Y\}, u) = \{3Y, 4Y\} \vee$$

$$7. \text{diag}(\{0Y, 4Y\}, i) = \{1Y\} \vee \text{diag}(\{0Y, 4Y\}, o) = \{3Y, 4Y\} \vee$$

$$\text{diag}(\{0Y, 4Y\}, a) = \{0Y, 4Y\} \vee \text{diag}(\{0Y, 4Y\}, u) = \{3Y, 4Y\} \vee$$

$$8. \text{diag}(\{0N, 2N, 3Y, 4Y\}, i) = UR(\{1\}) = \{1N\} \vee \text{diag}(\{0, 2, 3, 4\}, o) = UR(\{3\}) = \{3N, 4N\}$$

$$\text{diag}(\{0N, 2N, 3Y, 4Y\}, a) = UR(\{0, 2\}) = \{0Y, 2Y, 4Y\} \vee \text{diag}(\{0N, 2N, 3Y, 4Y\}, u) = \{2N, 0N, 4Y, 3Y\} \vee$$

$$9. \text{diag}(\{0Y, 2Y, 4Y\}, i) = \{1Y\} \vee \text{diag}(\{0Y, 2Y, 4Y\}, o) = \{3Y, 4Y\}$$

$$\text{diag}(\{0Y, 2Y, 4Y\}, a) = \{0Y, 4Y\} \vee \text{diag}(\{0Y, 2Y, 4Y\}, u) = \{3Y, 4Y, 2Y, 0Y\}$$

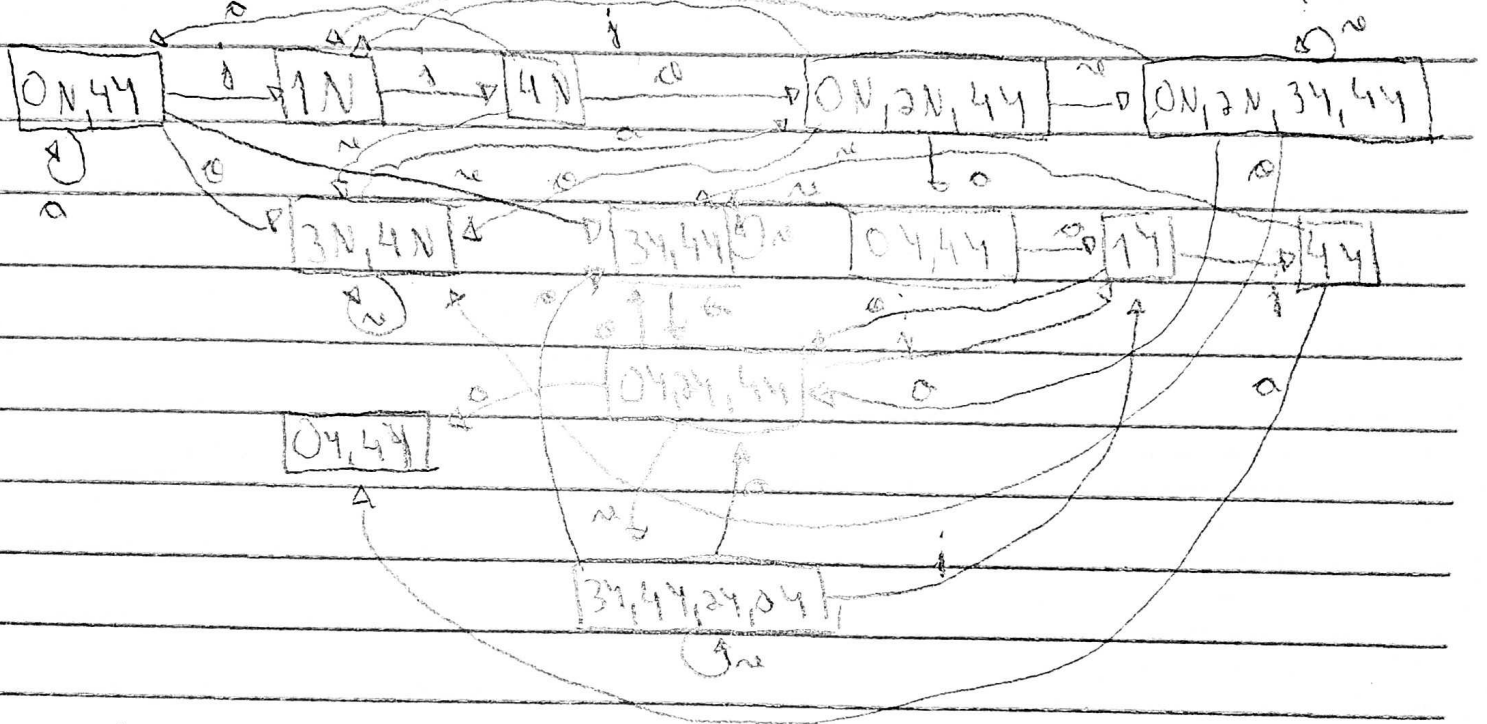
$$10. \text{diag}(\{1Y\}, i) = \{4Y\} \vee \text{diag}(\{1Y\}, o) = \{0Y, 2Y, 4Y\}$$

11.  $\text{diag}(\{0N, 4N\}, i = \text{UR}\{1N\} = \{1N\}) \text{diag}(\{0N, 4N\}, \emptyset) = \{3N, 4N\}$   
 $\text{diag}(\{0N, 4N\}, a) = \{0N, 44\}$   $\text{diag}(\{0N, 4N\}, u) = \{3N, 4N\}$

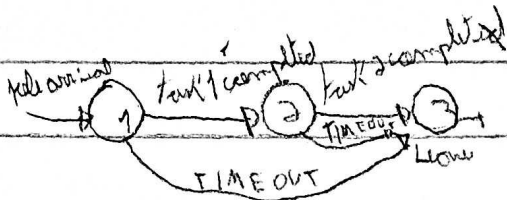
12.  $\text{diag}(\{44\}, a) = \{04, 44\}$   $\text{diag}(\{44, u\} = \{34, 44\}$

13.  $\text{diag}(\{34, 44, 24, 04\}, i) = \{14\}$   $\text{diag}(\{04, 24, 34, 44\}, \emptyset) = \{34, 44\}$

$\text{diag}(\{04, 24, 34, 44\}, a) = \{04, 24, 44\}$   $\text{diag}(\{04, 24, 34, 44\}, u) = \{04, 24, 34, 44\}$



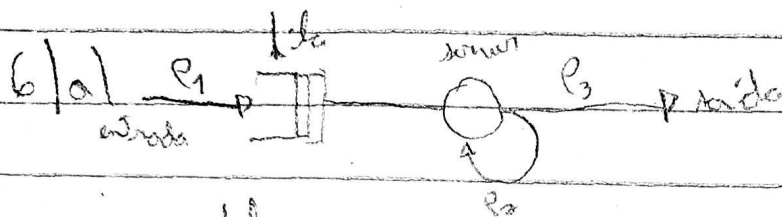
5)



① task 1

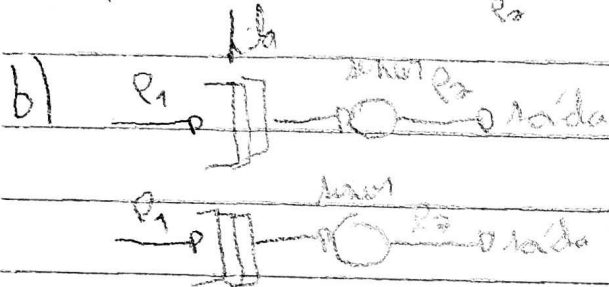
② task 2

③ saída do sistema



chega, entra no filo, entra no processador.

se  $P_2$  saí do sistema, se  $P_2$  vai para outro processador



2 filas com semáforos da mesma entrada

