

2º TESTE 2012/2013 (22/07)

Grupo I

1)

$\vdash$ - pessoa(P), veículo(v1), veículo(v2)

$v1 \neq v2$, dono(P, v1), dono(P, v2)

cor(c), cor(v1, c), cor(v2, c)

$\vdash$ - veículo(v), not tem - dono(v),

tem dono(v) $\vdash$ - veículo(v), pessoa(P), dono(P, v)

2)

$d(1..4) \rightarrow d(1), d(2), d(3), d(4) = \text{TRUE}$

$\{d(1), \dots, d(4), c, a(2), b(1), b(3), b(4)$

$d(1), \dots, d(4), c, a(3), b(1), b(2), b(4)$

$d(1), \dots, d(4), c, a(4), b(1), b(2), b(3)\}$

Sai $\Rightarrow$ 3) $\rightarrow \forall x \forall y ((\text{pai}(x, y) \vee \text{mãe}(x, y)) \Rightarrow \text{filho}(y, x))$

1) $[\text{pai}(x, y) \vee \text{mãe}(x, y)] \Rightarrow \text{filho}(y, x)$

2) $\text{filho}(y, x) \Rightarrow [\text{pai}(x, y) \vee \text{mãe}(x, y)]$

C4. 2) $\neg \text{filho}(y, x) \vee \text{pai}(x, y) \vee \text{mãe}(x, y)$

1) $\neg (\text{pai}(x, y) \vee \text{mãe}(x, y) \vee \text{filho}(y, x))$

$(\neg \text{pai}(x, y) \wedge \neg \text{mãe}(x, y)) \vee \text{filho}(y, x)$

$(\neg \text{pai}(x, y) \vee \text{filho}(y, x)) \wedge (\neg \text{mãe}(x, y) \vee \text{filho}(y, x))$

$\neg a \wedge \neg b \vee c$
 $= (\neg a \vee c) \wedge (\neg b \vee c)$

$\rightarrow \forall x (\text{pessoa}(x) \Rightarrow \exists y (\text{pai}(y, x) \vee \text{filho}(x, y)))$

$\forall x [\neg \text{pessoa}(x) \vee \exists y (\text{pai}(y, x) \vee \text{filho}(x, y))]$

$\forall x \exists y [\neg \text{pessoa}(x) \vee \text{pai}(y, x) \vee \text{filho}(x, y)]$

C3. $\neg \text{pessoa}(x) \vee \text{pai}(s_1(x), x) \vee \text{filho}(x, s_1(x))$

$$\neg ([\forall x (\neg \text{pessoa}(x)) \vee [\exists x \exists y (\text{filho}(x,y))]])$$

$$\exists x \text{ pessoa}(x) \wedge \forall x \forall y [\neg \text{filho}(x,y)]$$

C1.

C2.

$$\text{pessoa}(s_2) \wedge \neg \text{filho}(x,y)$$

$$\text{pessoa}(a) \quad \neg \text{pessoa}(x_1) \vee \text{pai}(s_1(x), x_1) \vee \text{filho}(x_1, s_1(x))$$

$x_1 = a$

$$\text{pai}(s_1(a), a) \vee \text{filho}(a, s_1(a))$$

$$\neg \text{filho}(x_2, y_2)$$

$$x_2 = a$$

$$y_2 = s_1(a)$$

$$5. \neg \text{pai}(x_3, y_3) \vee \text{filho}(y_3, x_3) \quad \text{pai}(s_1(a), a)$$

$$x_3 = s_1(a)$$

$$y_3 = a$$

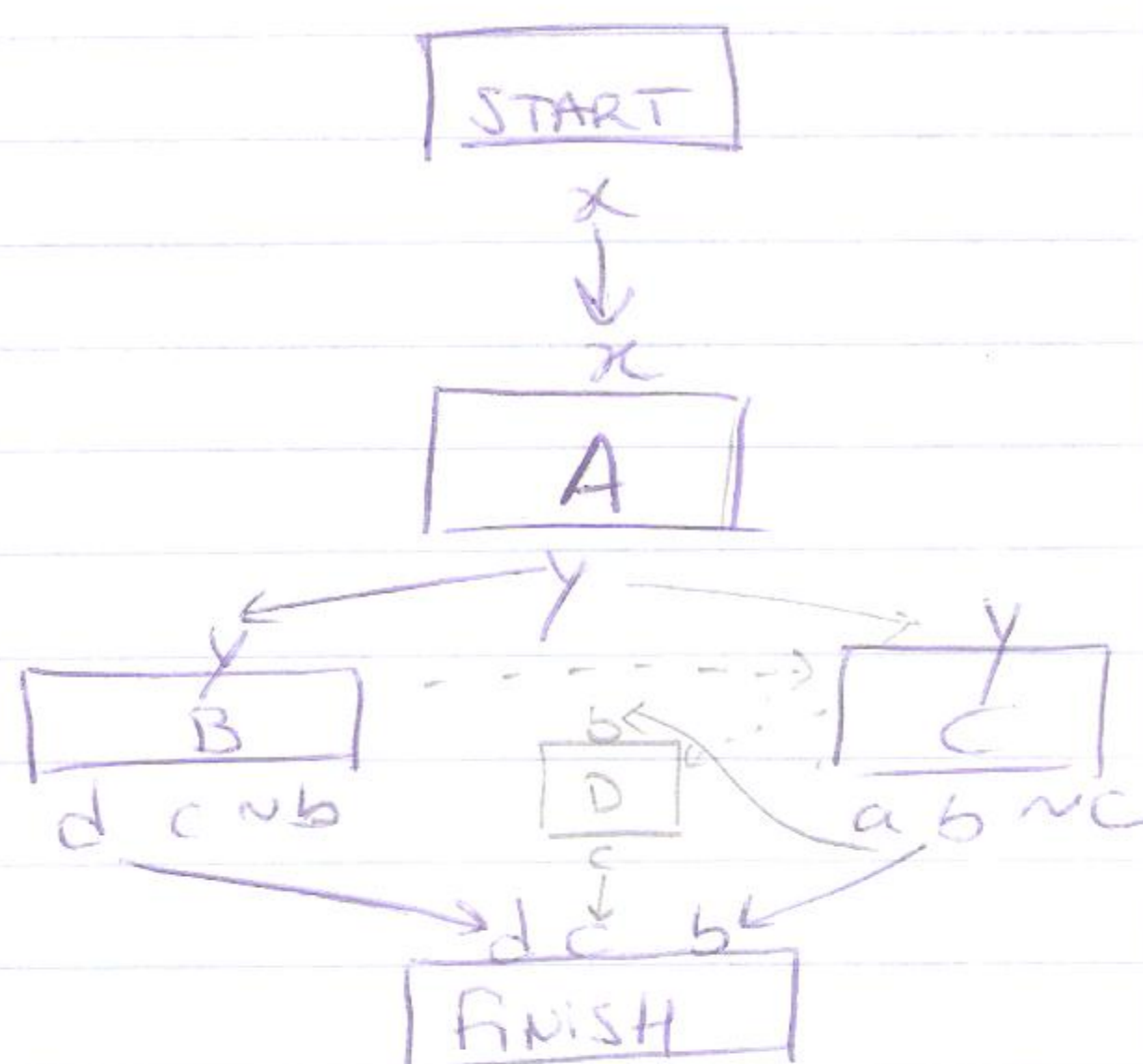
$$2. \neg \text{filho}(x_4, y_4) \quad \text{filho}(a, s_1(a))$$



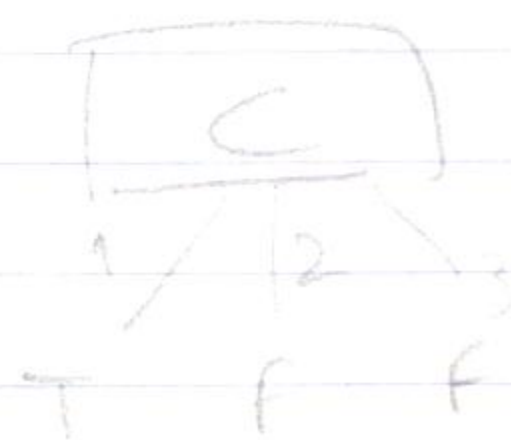
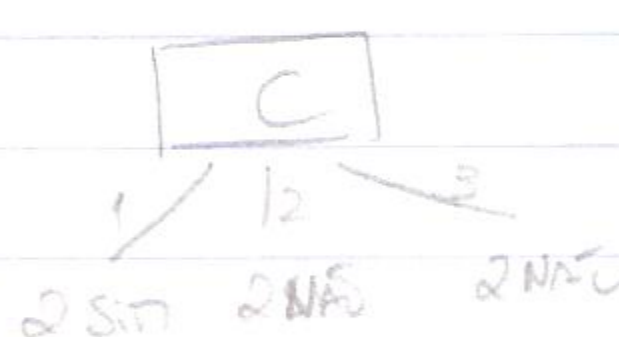
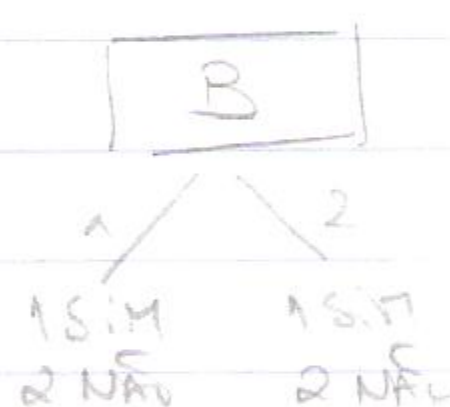
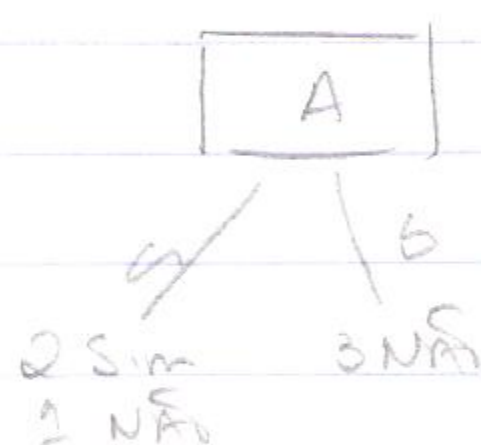
C.Q.D.

4)

$$A \rightarrow B \rightarrow C \rightarrow D$$



5)



Grupo II

1)

5 variáveis Aleatórias

→ Chuva

→ GREVE

→ TRANSITO

→ ATRASADOS

→ DESASTRES DE VIAGEM

$P(D=1)P(D=0)$

0.1 | 0.9

$P(G=1)P(G=0)$

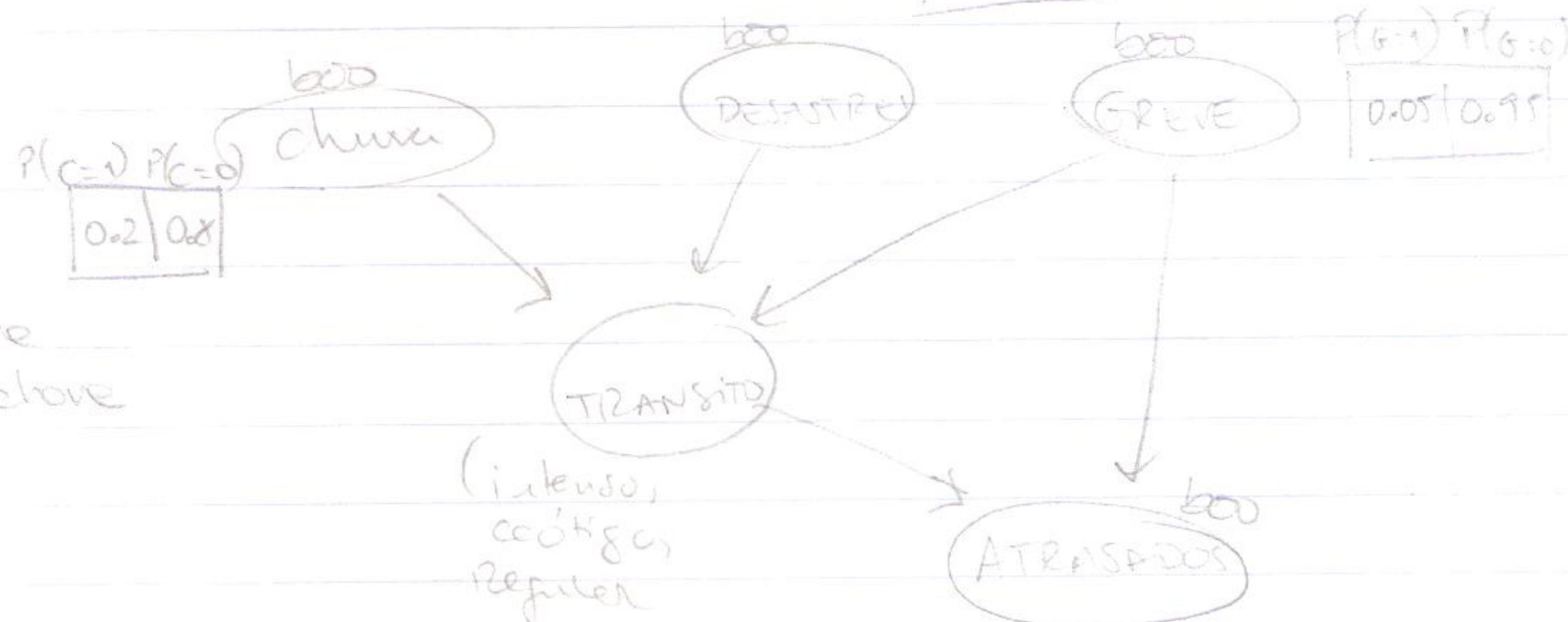
0.05 | 0.95

$P(C=1)P(C=0)$

0.2 | 0.8

$C=1 \rightarrow$ chuva

$C=0 \rightarrow$ não chuva



TRANSITO

D	C	G	CAÓTICO	Intenso	Regular	$P(T D,C,G)$
0	0	0	0.4	0.4	0.2	
0	0	1	0.5	0.4	0.1	
0	1	0	0.7	0.2	0.1	
0	1	1	0.8	0.1	0.1	
1	0	0	1	0	0	
1	0	1	1	0	0	
1	1	0	1	0	0	
1	1	1	1	0	0	

"O trânsito é sempre caótico".

G	T	A=1	A=0
0	C	.1	0
0	I	0.8	0.2
0	R	0.1	0.9
1	C	1	0
1	I	0.8	0.2
1	R	0.5	0.5

$P(A|T,G)$

2)

$$P(D=1 | T=C, G=0) = \frac{P(D=1, T=C, G=0)}{P(T=C, G=0)}$$

$$= \cancel{P(D=1, T=C, G=0)}$$

$$P(D=?, T=C, G=0) = \sum_{c \in \{0,1\}} \sum_{a \in \{0,1\}} P(D=?, T=C, G=0, C=c, A=a)$$

$$= \sum_c \sum_a P(C=c) \times P(D=?) \times P(G=0) \times P(T=C | C=c, D=?, G=0) \times P(A=a | T=C, G=0)$$

$$= P(D=?) \times P(G=0) \times \sum_{c \in \{0,1\}} P(C=c) \times P(T=C | C=c, D=?, G=0)$$

$$\underline{D=1} = P(D=1) \times P(G=0) \times \sum_{c=0}^{c=0} P(C=c) \times P(T=C | C=c, D=1, G=0) = 0.1 \times 0.95 \times (0.8 \times 1 + 0.2 \times 1) = 0.095$$

$$\underline{D=0} = 0.9 \times 0.95 \times \left(\overset{c=0}{0.8 \times 0.4} + \overset{c=1}{0.2 \times 0.7} \right) = 0.3933$$

$$P(D=1 | T=C, G=0) = \frac{0.095}{0.095 + 0.3933} = 0.1946 \quad \underline{19.46\%}$$

$$3) P(T=i, C=1, A=1) = \sum_{d \in \{0,1\}} \sum_{g \in \{0,1\}} P(T=i, C=1, A=1, D=d, G=g)$$

$$= \sum_d \sum_g P(C=1) \times P(D=d) \times P(G=g) \times P(T=i | C=1, G=g, D=d) \times P(A=1 | T=i, G=g)$$

$$= P(C=1) \times \sum_{g \in \{0,1\}} P(G=g) \times P(A=1 | T=i, G=g) \times$$

$$\times \sum_{d \in \{0,1\}} P(D=d) \times P(T=i | C=1, G=g, D=d)$$

$$= 0.2 \times \left[\overset{G=1}{0.05 \times 0.8 \times (0.1 \times 0 + 0.9 \times 1)} + 0.95 \times 0.8 \times (0.1 \times 0 + 0.9 \times 0.2) \right] = 0.02808$$