Phi 270 F00 test 5

Analyze the following sentences in as much detail as possible, providing a key to the non-logical vocabulary (upper and lower case letters) appearing in your answer. Notice the additional instructions given for each of the first two.

1. There is a yak that someone yoked. [Give this analysis also using an unrestricted quantifier.]
   answer
2. Each explorer mapped a route. [This sentence is ambiguous. Analyze it in two nonequivalent ways, and describe a situation in which the sentence is true on one of your analyses and false on the other.]
   answer
3. Exactly one reindeer was red nosed. [You may leave the predicate _ was red nosed unanalyzed.]
   answer

Analyze the sentence below using each of the two ways of analyzing the definite description the fireplace. That is, analyze it using Russell's analysis of definite descriptions as quantifier phrases and then analyze it again using the description operator.

4. Santa gained entry through the fireplace.
   answer

Use derivations to show that the following argument is valid. You may use any rules.

5. $\exists x\, \forall y\, (Fy \rightarrow Rxy)$
   ___
   $\forall x\, (Fx \rightarrow \exists y\, Ryx)$
   answer
   That is: Something is relevant to all findings ⇒ Each finding has something relevant to it
   [Don't hesitate to ignore this English reading if it doesn't help you think about the argument.]

Use a derivation to show that the following argument is not valid and describe a structure dividing an open gap.

6. $\exists x\, \exists y\, (\neg\, y = x \wedge Rxy)$
   ___
   $\exists x\, \neg\, Rxx$
   answer

Complete the following to give a definition of inconsistency in terms of truth values and possible worlds:

7. A set Γ is inconsistent if and only if …
   answer

Complete the following truth table by calculating the truth value of the sentence on the given assignment. Show the value of each component by writing it under the main connective of that component.

8.

A B C D	(A ∨ ¬ B) ∧ ¬ (C → D)
T F T F	

answer

Describe a structure (i.e., an assignment of extensions to the non-logical vocabulary) which makes the sentences below all true. (You may use either tables or a diagram.)

9. a = c, fc = b, d = e, Fc, Fd, ¬ Fb, Rab, Rea, R(fa)b, ¬ Re(fc)

answer

Phi 270 F00 test 5 answers

1. There is a yak that someone yoked
something is a yak that someone yoked
something is such that (it is a yak that someone yoked)
∃x x is a yak that someone yoked
∃x (x is a yak ∧ someone yoked x)
∃x (Yx ∧ someone is such that (he or she yoked x))
∃x (Yx ∧ (∃y: y is a person) y yoked x)

∃x (Yx ∧ (∃y: Py) Kyx)
∃x (Yx ∧ ∃y (Py ∧ Kyx))

K: [_ yoked _]; P: [_ is a person]; Y: [_ is a yak]

2. *first analysis:*
Each explorer mapped a route
each explorer is such (he or she mapped a route)
(∀x: x is an explorer) x mapped a route
(∀x: Ex) some route is such that (x mapped it)
(∀x: Ex) (∃y: y is a route) x mapped y

(∀x: Ex) (∃y: Ry) Mxy

second analysis:
Each explorer mapped a route
some route is st (each explorer mapped it)
(∃x: x is a route) each explorer mapped x
(∃x: Rx) each explorer is such that (he or she mapped x)
(∃x: Rx) (∀y: y is an explorer) y mapped x

(∃x: Rx) (∀y: Ey) Myx

P: [_ is an explorer]; M: [_ mapped _]; R: [_ is a route]
The first is true and the second false if every explorer mapped some route or other but no one route was mapped by all explorers

3. Exactly one reindeer was red nosed

at least one reindeer was red nosed ∧ ¬ at least two reindeer were red nosed

some reindeer is such that (it was red nosed) ∧ ¬ at least two reindeer were such that (they were red nosed)

(∃x: x is a reindeer) x was red nosed ∧ ¬ (∃x: x is a reindeer) (∃y: y is a reindeer ∧ ¬ y = x) (x was red nosed ∧ y was red nosed)

$$(\exists\, x\colon Rx)\ Nx \wedge \neg\ (\exists\, x\colon Rx)\ (\exists\, y\colon Ry \wedge \neg\ y = x)\ (Nx \wedge Ny)$$

or:

Exactly one reindeer was red nosed

some reindeer is such that (it was red nosed and no other reindeer was red nosed)

(∃x: x is a reindeer) (x was red nosed and no other reindeer was red nosed)

(∃x: Rx) (Nx ∧ no reindeer other than x was red nosed)

(∃x: Rx) (Nx ∧ no reindeer other than x is such that (it was red nosed)

(∃x: Rx) (Nx ∧ (∀y: y is a reindeer ∧ ¬ y = x) ¬ y was red nosed)

$$(\exists\, x\colon Rx)\ (Nx \wedge (\forall y\colon Ry \wedge \neg\ y = x)\ \neg\ Ny)$$

or:

$$(\exists\, x\colon Rx)\ (Nx \wedge (\forall y\colon Ry \wedge Ny)\ x = y)$$

N: [_ was red nosed]; R: [_ is a reindeer]

The generalization using the variable y must be resricted to reindeer or else the sentence will say that some reindeer is the only and only thing that is red nosed—i.e., that there is exactly one red-nosed thing and it is a reindeer.

4. *using Russell's analysis:*

Santa gained entry through the fireplace

the fireplace is such that (Santa gained entry through it)

(∃x: x and only x is a fireplace) Santa gained entry through x

(∃x: x is a fireplace ∧ (∀y: ¬ y = x) ¬ y is a fireplace) Gsx

$$(\exists x\colon Fx \wedge (\forall y\colon \neg\ y = x)\ \neg\ Fy)\ Gsx$$

or:

$$(\exists x\colon Fx \wedge (\forall y\colon Fy)\ x = y)\ Gsx$$

using the description operator:

Santa gained entry through the fireplace

G s (the fireplace)

G s (℩x x is a fireplace)

$$Gs(\iota x\ Fx)$$

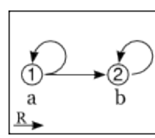
F: [_ is a fireplace]; G: [_ gained entry through _]; s: Santa

5.

	$\exists x \forall y (Fy \to Rxy)$	
	ⓐ	
	$\forall y (Fy \to Ray)$	b:4
	ⓑ	
	Fb	(5)
4 UI	$Fb \to Rab$	5
5 MPP	Rab	(6)
6 EG	$\exists y\, Ryb$	X, (7)
	●	
7 QED	$\exists y\, Ryb$	3
3 CP	$Fb \to \exists y\, Ryb$	2
2 UG	$\forall x (Fx \to \exists y\, Ryx)$	1
1 PCh	$\forall x (Fx \to \exists y\, Ryx)$	

6.

	$\exists x \exists y (\neg y = x \wedge Rxy)$	1
	ⓐ	
	$\exists y (\neg y = a \wedge Ray)$	2
	ⓑ	
	$\neg b = a \wedge Rab$	3
3 Ext	$\neg b = a$	
3 Ext	Rab	
	$\forall x\, Rxx$	a:5, b:6
5 UI	Raa	
6 UI	Rbb	
	○	$\neg b = a$, Rab, Raa, $Rbb \not\Rightarrow \bot$
	$\bot$	4
4 NcP	$\exists x \neg Rxx$	2
2 PCh	$\exists x \neg Rxx$	1
1 PCh	$\exists x \neg Rxx$	



7. A set Γ is inconsistent if and only if there is no possible world in which every member of Γ is true

8.

A	B	C	D	(A ∨ ¬ B) ∧ ¬ (C → D)
T	F	T	F	T T Ⓣ T F

9.

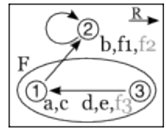
range:
1, 2, 3

a	b	c	d	e
1	2	1	3	3

τ	fτ
1	2
2	2
3	3

τ	Fτ
1	T
2	F
3	T

R	1	2	3
1	F	T	F
2	F	T	F
3	T	F	F



(The diagram above provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.)

alias sets	*IDs*	*values*
a	1	a: 1
c		c: 1
b	2	b: 2
fa		f1: 2
fc		f1: 2
d	3	d: 3
e		e: 3

resources	*values*
Fc	F1: **T**
Fd	F3: **T**
¬ Fb	F2: **F**
Rab	R12: **T**
Rea	R31: **T**
R(fa)b	R22: **T**
¬ Re(fc)	R32: **F**