Phi 270 F02 test 3 [in pdf format]

Analyze the sentences below in as much detail as possible *using connectives*; that is, you *should not* identify components that are individual terms (or predicates or functors). Present the result in *both symbolic and English notation*. Be sure that the unanalyzed components of your answer are complete and independent sentences; also try to respect any grouping in the English.

1. *They'll be here soon unless they had car trouble*
   [answer]
2. *If it snowed, then the schools were open only if the plows got out early.*
   [answer]

Use derivations to check whether each of the entailments below holds. You may use detachment and attachment rules. If an entailment fails, present a counterexample that divides an open gap.

3. A → (¬ B → C) ⇒ ¬ C → (A → B)
   [answer]
4. A → (¬ B → C) ⇒ C → (A → B)
   [answer]

Analyze the sentence below in as much detail as possible. In this case you *should* identify components that are individual terms, predicates, or functors. Be sure that the unanalyzed components of your answer are independent (in particular, that none contains a pronoun whose antecedent is in another).

5. *Al is Bob's father and Bob works for him*
   [answer]

Synthesize an English sentence with the following logical form:

6. Sa(mb) → ¬ S(ma)b
   [S: λxy (x *went to school with* y); a: *Al*; b: *Bob*; m: λx (x*'s mother*)]
   [answer]

Use a derivation to show that the entailment below holds. You may use detachment and attachment rules.

7. Fa → C, Fb ⇒ a = b → C
   [answer]

Phi 270 F02 test 3 answers

1. *They'll be here soon unless they had car trouble*
   They'll be here soon ← ¬ they had car trouble
   $$S \leftarrow \neg T \ [or: \neg T \rightarrow S]$$
   `if not T then S`
   [S: *they'll be here soon*; T: *they had car trouble*]

2. *If it snowed, then the schools were open only if the plows got out early*
   it snowed → the schools were open only if the plows got out early
   it snowed → (¬ the schools were open ← ¬ the plows got out early)
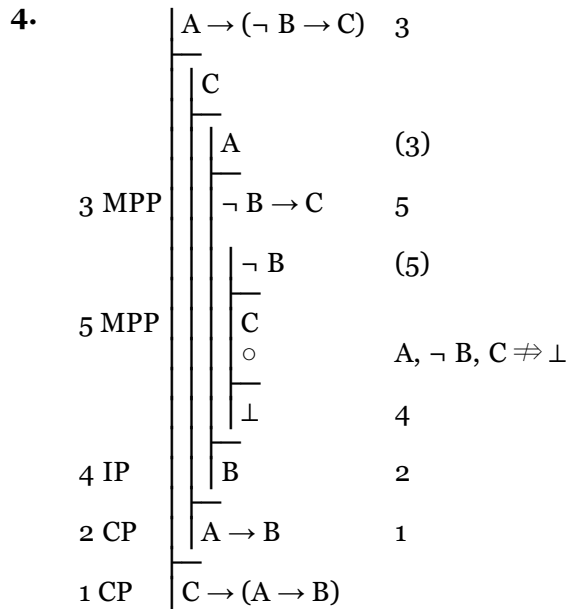 $$S \rightarrow (\neg O \leftarrow \neg E) \ [or: S \rightarrow (\neg E \rightarrow \neg O)]$$
   `if S then if not E then not O`
   [E: *the plows got out early*; O: *the schools were open*; S: *it snowed*]

3.

	A → (¬ B → C)	3
	¬ C	(4)
	A	(3)
3 MPP	¬ B → C	4
4 MTT	B	(5)
	●	
5 QED	B	2
2 CP	A → B	1
1 CP	¬ C → (A → B)	

4.

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     │ A → (¬ B → C)   3
     │ ┌─────────────
     │ │ C
     │ │ ┌─────────────
     │ │ │ A              (3)
3 MPP│ │ │ ¬ B → C        5
     │ │ │ ┌─────────────
     │ │ │ │ ¬ B          (5)
5 MPP│ │ │ │ C
     │ │ │ │ ○            A, ¬ B, C ⇏ ⊥
     │ │ │ │ ⊥            4
4 IP │ │ │ B              2
2 CP │ │ A → B            1
1 CP │ C → (A → B)
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A	B	C	A → (¬ B → C)	/	C → (A → B)
T	F	T	Ⓣ T T		Ⓕ F

5. *Al is Bob's father and Bob works for him*
Al is Bob's father ∧ Bob works for Al
Al = Bob's father ∧ [λx (x works for y)] Bob Al
a = [λx (x's father)] *Bob* ∧ Wba
a = fb ∧ Wba
[W: λx (x *works for* y); a: *Al*; b: *Bob*; f:λx (x's father)]

6. S *Al* ([λx (x's mother)] *Bob*) → ¬ S ([λx (x's mother)] *Al*) *Bob*
[λxy (x *went to school with* y)] *Al Bob's mother* → ¬ [λxy (x
   went to school with y)] *Al's mother Bob*
*Al went to school with Bob's mother → ¬ Al's mother went to
   school with Bob*
*Al went to school with Bob's mother → Al's mother didn't go
   to school with Bob*
*If Al went to school with Bob's mother, then Al's mother
   didn't go to school with Bob*

7.

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     │ Fa → C         3
     │ Fb             (4)
     │ ┌─────────────
     │ │ a = b         a-b
     │ │ ┌─────────────
     │ │ │ ¬ C         (3)
3 MTT│ │ │ ¬ Fa        (4)
     │ │ │ ●
4 Nc=│ │ │ ⊥           2
2 IP │ │ C             1
1 CP │ a = b → C
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