Phi 270 F99 test 2

Analyze the sentence below in as much detail as possible, presenting 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. Fred crossed the desert without having both a jack and a spare tire.
    answer

2. Bob either found someone to go or went himself, but neither Carol nor her luggage was there.
    answer

Use derivations to check whether each of the entailments below holds. You may use detachment and attachment rules. If an entailment fails, provide a table in which you calculate the truth values of the premises and conclusion on an extensional interpretation (i.e., an assignment of truth values) that divides an open gap.

3. $A \wedge \neg B \Rightarrow \neg (B \wedge \neg C)$
    answer

4. $\neg (\neg A \wedge B) \Rightarrow C$
    answer

5. $(A \wedge B) \vee C, \neg (A \wedge D) \Rightarrow C \vee \neg D$
    answer

6. $B \vee (C \wedge D) \Rightarrow A \vee (B \vee C)$
    answer

7. [This question was on a topic not covered in F06] Use replacement principles to put the following sentence into disjunctive normal form (in which there are no negated compounds and no conjunction has a disjunction as a component):

    $$\neg ((A \wedge \neg B) \vee C)$$

    answer

Phi 270 F99 test 2 answers

1. Fred crossed the desert without having both a jack and a spare tire

    Fred crossed the desert $\wedge \neg$ Fred had both a jack and a spare tire

    Fred crossed the desert $\wedge \neg$ (Fred had a jack $\wedge$ Fred had a spare tire)

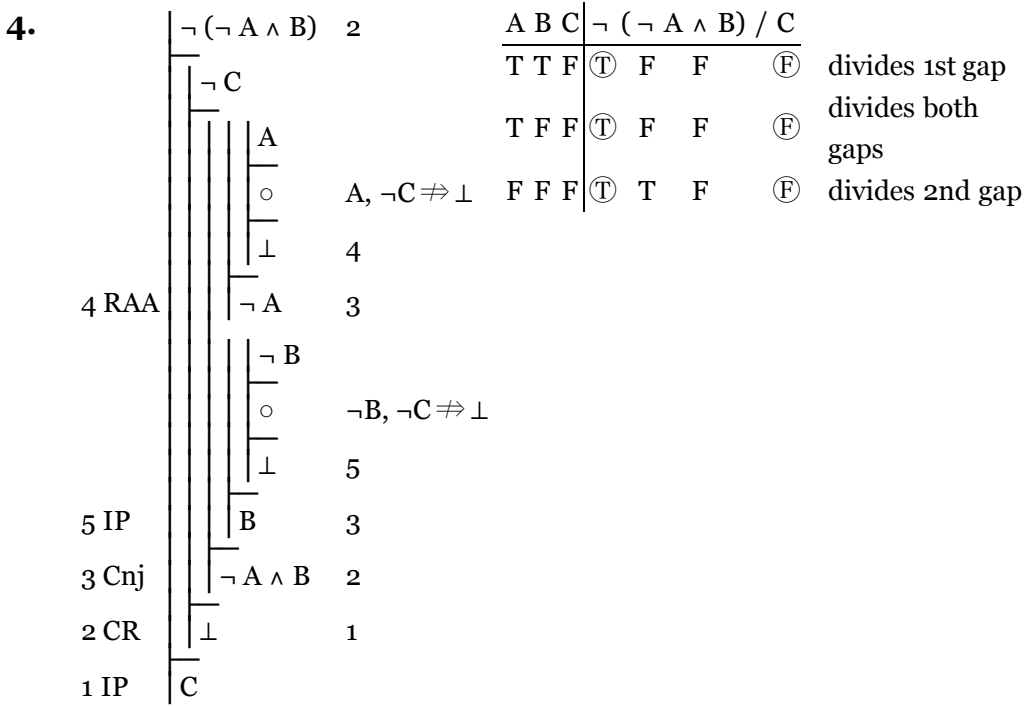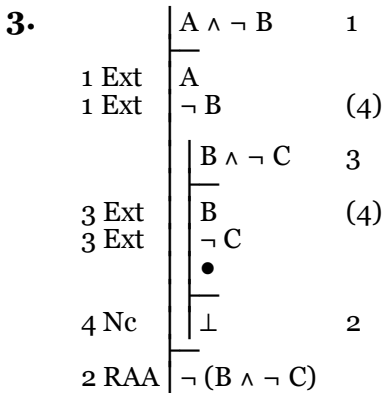 $$D \wedge \neg (J \wedge S)$$

    both D and not both J and S

    D: Fred crossed the desert; J: Fred had a jack; S: Fred had a

spare tire

2. Bob either found someone to go or went himself, but neither Carol nor her luggage was there

Bob either found someone to go or went himself ∧ neither Carol nor her luggage was there

(Bob found someone to go ∨ Bob went himself) ∧ ¬ either Carol or her luggage was there

(Bob found someone to go ∨ Bob went himself) ∧ ¬ (Carol was there ∨ Carol's luggage was there)

$$(F \lor W) \land \lnot (C \lor L)$$

both either F or W and not either C or L

F: Bob found someone to go; W: Bob went himself; C: Carol was there; L: Carol's luggage was there

3.

	A ∧ ¬ B	1
1 Ext	A	
1 Ext	¬ B	(4)
	B ∧ ¬ C	3
3 Ext	B	(4)
3 Ext	¬ C	
	●	
4 Nc	⊥	2
2 RAA	¬ (B ∧ ¬ C)	

4.

	¬ (¬ A ∧ B)	2
	¬ C	
	A	
	○	A, ¬C ⇏ ⊥
	⊥	4
4 RAA	¬ A	3
	¬ B	
	○	¬B, ¬C ⇏ ⊥
	⊥	5
5 IP	B	3
3 Cnj	¬ A ∧ B	2
2 CR	⊥	1
1 IP	C	

A	B	C	¬ (¬ A ∧ B) / C				
T	T	F	Ⓣ	F	F	Ⓕ	divides 1st gap
T	F	F	Ⓣ	F	F	Ⓕ	divides both gaps
F	F	F	Ⓣ	T	F	Ⓕ	divides 2nd gap

5.

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| (A ∧ B) ∨ C    3                              | (A ∧ B) ∨ C    2
| ¬ (A ∧ D)      5        OR                    | ¬ (A ∧ D)      4
|  |  ¬ C                                       |  |  ¬ C              (2)
|  |  |  D              (6)        2 MTP        |  |  A ∧ B          3
|  |  |  |  A ∧ B       4          3 Ext        |  |  A             (4)
4 Ext |  |  A           (6)        3 Ext        |  |  B
4 Ext |  |  B                      4 MPT        |  |  ¬ D           (5)
6 Adj |  |  |  A ∧ D    X,(7)                   |  |  •
      |  |  |  •                   5 QED        |  |  ¬ D           1
7 QED |  |  A ∧ D       5          1 PE         |  C v ¬ D
5 CR  |  |  ⊥           3
      |  |  C
      |  |  ⊥           3
3 PC  |  |  ⊥           2
2 RAA |  ¬ D            1
1 PE  | C v ¬ D
```

6.

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| B ∨ (C ∧ D)    2                              | B ∨ (C ∧ D)    3
|                        OR
|  |  ¬ A                                       |  |  ¬ A
|  |  |  B              (4)                     |  |  |  ¬ B           (3)
|  |  |  |  ¬ C                    3 MTP        |  |  |  C ∧ D         4
|  |  |  |  •                      4 Ext        |  |  |  C             (5)
4 QED |  |  |  B        3          4 Ext        |  |  |  D
3 PE  |  |  B v C       2                       |  |  |  •
      |  |  |  C ∧ D     5         5 QED        |  |  C               2
5 Ext |  |  |  C        (7)        2 PE         |  B v C             1
5 Ext |  |  |  D                   1 PE         | A v (B v C)
      |  |  |  |  ¬ B
      |  |  |  |  •
7 QED |  |  |  C        6
6 PE  |  |  B v C       2
2 PC  |  B v C          1
1 PE  | A v (B v C)
```

7. [This question was on a topic not covered in F06]

$\neg ((A \land \neg B) \lor C)$

$\Leftrightarrow$

$\neg (A \land \neg B) \land \neg C$

$\Leftrightarrow$

$(\neg A \lor B) \land \neg C$

$\Leftrightarrow$

$(\neg A \land \neg C) \lor (B \land \neg C)$