Phi 270 F02 test 2

1. Define inconsistency by completing the following:

   Γ is inconsistent (i.e., Γ ⇒ ⊥) if and only if ... .

   (Your answer need not replicate the wording of the text's definitions, but it should define equivalence in terms of truth values and possible worlds.)

   answer

Analyze each 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.

2. Al needed both the book and the disk but Bob didn't.

   answer

3. The car wasn't there or neither Al nor Barb saw it.

   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.

4. A ∧ ¬ B ⇒ ¬ (A ∧ ¬ C)

   answer

5. (A ∧ B) ∨ C, ¬ (C ∧ ¬ B) ⇒ B

   answer

6. B ∨ (A ∨ C) ⇒ A ∨ B

   answer

7. [This question was on a topic not covered in F06] Construct a sentence in symbolic notation that has the following truth table:

A	B	C	?
T	T	T	F
T	T	F	T
T	F	T	T
T	F	F	F
F	T	T	T
F	T	F	F
F	F	T	T
F	F	F	F

   answer

Phi 270 F02 test 2 answers

1. Γ ⇒ ⊥ if and only if there is no possible world in which all members of Γ are true.

2. Al needed both the book and the disk ∧ Bob didn't need both the book and the disk

(Al needed the book ∧ Al needed the disk) ∧ ¬ Bob needed both the book and the disk

(Al needed the book ∧ Al needed the disk) ∧ ¬ (Bob needed the book ∧ Bob needed the disk)

$$(B \wedge D) \wedge \neg (O \wedge S)$$

both both B and D and not both O and S

B: Al needed the book; D: Al needed the disk; O: Bob needed the book; S: Bob needed the disk

3. The car wasn't there ∨ neither Al nor Barb saw the car

¬ the car was there ∨ ¬ either Al or Barb saw the car

¬ the car was there ∨ ¬ (Al saw the car ∨ Barb saw the car)

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

either not C or not either A or B

A: Al saw the car; B: Barb saw the car; C: the car was there

4.

	A ∧ ¬ B	1
1 Ext	A	
1 Ext	¬ B	

		A ∧ ¬ C	3
3 Ext		A	
3 Ext		¬ C	
		○	A, ¬ B, ¬ C ⇏ ⊥
		⊥	2
2 RAA		¬ (A ∧ ¬ C)	

A B C	A ∧ ¬ B /	¬ (A ∧ ¬ C)
T F F	Ⓣ T	Ⓕ T T

5.

```
                  │ (A ∧ B) ∨ C      1
                  │ ¬ (C ∧ ¬ B)      5
                  ├──────────
                  │ │ A ∧ B          2
                  │ ├──────────
2 Ext             │ │ A
2 Ext             │ │ B              (3)
                  │ │ ●
                  │ ├──────────
3 QED             │ │ B              1
                  │ │ C              (6)
                  │ ├──────────
                  │ │ │ ¬ B          (6)
                  │ │ ├──────────
6 Adj             │ │ │ │ C ∧ ¬ B    X,(7)
                  │ │ │ │ ●
                  │ │ │ ├──────────
7 QED             │ │ │ │ C ∧ ¬ B    5
                  │ │ ├──────────
5 CR              │ │ │ ⊥            4
                  │ ├──────────
4 IP              │ │ B             1
                  ├──────────
1 PC              │ B
```

6.

A	B	C	B ∨ (A ∨ C) / A ∨ B		
F	F	T	Ⓣ	T	Ⓕ

```
                  │ B ∨ (A ∨ C)      2
                  ├──────────
                  │ │ ¬ A            (6)
                  │ ├──────────
                  │ │ │ B            (3)
                  │ │ ├──────────
                  │ │ │ ●
                  │ │ ├──────────
3 QED             │ │ │ B            2
                  │ │ │ A ∨ C        4
                  │ │ ├──────────
                  │ │ │ │ A          (6)
                  │ │ │ ├──────────
                  │ │ │ │ │ ¬ B
                  │ │ │ │ ├──────────
                  │ │ │ │ │ ●
                  │ │ │ │ ├──────────
6 Nc              │ │ │ │ │ ⊥        5
                  │ │ │ ├──────────
5 IP              │ │ │ │ B          4
                  │ │ │ │ C
                  │ │ │ ├──────────
                  │ │ │ │ │ ¬ B
                  │ │ │ │ ├──────────
                  │ │ │ │ │ ○        ¬ A, ¬ B, C ⇏ ⊥
                  │ │ │ │ ├──────────
                  │ │ │ │ │ ⊥        7
                  │ │ │ ├──────────
7 IP              │ │ │ │ B          4
                  │ │ ├──────────
4 PC              │ │ │ B            2
                  │ ├──────────
2 PC              │ │ B              1
                  ├──────────
1 PE              │ A ∨ B
```

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

A B C	(A ∧ B ∧ ¬ C) ∨	(A ∧ ¬ B ∧ C) ∨	(¬ A ∧ B ∧ C)	∨	(¬ A ∧ ¬ B ∧ C)
T T T	F	F	F	F	F
T T F	**T**	F	F	T	F
T F T	F	**T**	F	T	F
T F F	F	F	F	F	F
F T T	F	F	**T**	T	F
F T F	F	F	F	F	F
F F T	F	F	F	T	**T**
F F F	F	F	F	F	F