(A)

1.

B	¬B ∧ B	
T	F	F
F	T	F

→ contradiction

2.

D	¬D ∨ D	
T	F	T
F	T	T

→ tautology

3.

A	B	(A ∧ B) ∨ (B ∧ A)		
T	T	T	T	T
T	F	F	F	F
F	T	F	F	F
F	F	F	F	F

→ neither

4.

A	B	¬[A → (B → A)]		
T	T	F	T	T
T	F	T	F	F
F	T	F	T	T
F	F	F	T	T

→ neither

5.

A	B	A ↔ [A → (B ∧ ¬B)]			
T	T	T	F	F	F
T	F	T	F	T	T
F	T	F	T	F	F
F	F	F	T	F	T

→ neither

6

A	B	¬(A∧B)	↔	A
T	T	F	T	F
T	F	T	F	T
F	T	T	F	F
F	F	T	F	F

→ neither

7.

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

→ neither

8.

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

→ tautology

9.

A	B	C	D		(B∧D)	↔	[A	↔	(A∨C)]
T	T	T	T		T	T	T	T	T
T	T	T	F		F	F	T	T	T
T	T	F	T		T	T	T	T	T
T	T	F	F		F	F	T	T	T
T	F	T	T		F	F	T	T	T
T	F	T	F		F	F	T	T	T
T	F	F	T		F	F	T	T	T
T	F	F	F		F	F	T	T	T
F	T	T	T		T	F	F	F	T
F	T	T	F		F	T	F	F	T
F	T	F	T		T	F	F	T	F
F	T	F	F		F	F	F	T	F
F	F	T	T		T	F	F	F	T
F	F	T	F		F	T	F	F	T
F	F	F	T		F	F	F	T	F
F	F	F	F		F	F	F	T	F

→ neither

(4)

1.

A	A	¬A
T	T	F F

→ not equivalent

2.

A	A	A ∨ A
T	T	T + T
F	F	F ∨ F

→ tautologically equivalent

3.

A	A → A	A ↔ A
F	F T F	F F F

→ not equivalent

4.

A	B	A ∨ ¬B	A → B
T	F	T + TF	T FF
F T		P F F T	T T T

→ not equivalent

5.

A ∧ ¬A	¬B ↔ B
F	F
F	F
F	F
F	F

→ equivalent

6.

¬(A∧B) | ¬A ⟺ ∨ ¬B

+	F F +	X F +		F F +
F	+ + +	X F +		+ F +

A·B								
+ +	F	+	F	F	F
+ F	+	F	+	+	+
F +	+	F	+	+	F
F F	+	F	+	+	+

→ equivalent

7.

¬(A → B) | ¬A → ¬B

+	+ F F	X + F	F	F +
F	+ + +	F +	+	F +

→ not equivalent

8.

A B	(A → B)	(¬B → ¬A)
+ +	+	F + F
+ F	F	+ F F
F +	+	+ + +
F F	+	+ + +

→ equivalent

or

↓

(A→B)	(¬B → ¬A)
+ + F +	+ F F F +
+ F + X +	F + + +

↑

→ equivalent

1.

A ∧ B	B C → ¬D	C
+ + +	+ + + F	+

→ inconsistent

2.

A → B	B → C	A	¬C
+ + F	F + F	+	+ F

→ inconsistent

k_2

3.

A ∨ B	B ∨ C	C → ¬A
F + +	+ + F	F + + F

→ consistent

4.

A	B	C	¬D	¬E	F
+	+	+	+ F	+ F	+

→ consistent

Ⓒ

1.

$$\frac{A \lor [A \to (A \leftrightarrow A)] \Big| A}{F \ t \ \ F \ t \ \ F \ t \ F \ \Big| \ F} \qquad \to \text{invalid}$$

2.

$$\frac{A \leftrightarrow \neg (B \leftrightarrow A) \Big| A}{F \ t \ \ F \ F \ t \ F \ \Big| \ F} \qquad \to \text{invalid}$$

3.

$$\frac{A \to B \Big| B \Big| A}{F \ t \ t \Big| t \Big| F} \qquad \to \text{invalid}$$

4.

$$\frac{A \lor B \Big| B \lor C \Big| \neg B \Big| A \land C}{t \ t \ F \Big| F \ t \ t \Big| t \ F \Big| t \ F \ t} \qquad \to \text{valid}$$

$$\underset{\text{not possible}}{\uparrow}$$

5.

$$\frac{A \leftrightarrow B \Big| B \leftrightarrow C \Big| A \leftrightarrow C}{t \ t \ t \times F \ t \ F \Big| t \ F \ F}$$
$$\frac{}{F \ t \ t \times t \ t \ t \Big| F \ F \ t} \qquad \to \text{valid}$$