2020 Spring, HW-1

Due date: April 15th 11:59 p.m. through AjouBb

A. Show that the following formulas are tautologies. (4 Points)

① $\neg(A \vee B) \Leftrightarrow \neg A \wedge \neg B$

② $(A \vee B) \wedge (\neg B \vee C) \Rightarrow (A \vee C)$

(답)

①

A	B	¬A	¬B	(A ∨ B)	¬(A ∨ B)	(¬A ∧ ¬B)	¬(A ∨ B) ⇔ (¬A ∧ ¬B)
t	t	f	f	t	f	f	t
t	f	f	t	t	f	f	t
f	t	t	f	t	f	f	t
f	f	t	t	f	t	t	t

②

A	B	C	¬B	A∨B	¬B ∨ C	(A ∨ B) ∧ (¬B ∨ C)	A∨C	(A ∨ B) ∧ (¬B ∨ C) ⇒ (A ∨ C)
t	t	t	f	t	t	t	t	t
t	t	f	f	t	f	f	t	t
t	f	t	t	t	t	t	t	t
f	t	t	f	t	t	t	t	t
t	f	f	t	t	t	t	t	t
f	t	f	f	t	f	f	f	t
f	f	t	t	f	t	f	t	t
f	f	f	t	f	t	f	f	t

B. Transform the following statement into conjunctive normal form. (2 Points)

$A \wedge (A \Rightarrow B) \Rightarrow B$

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$(A \wedge (\neg A \vee B)) \Rightarrow B \equiv \neg\ (A \wedge (\neg A \vee B)) \vee B \equiv \neg((A \wedge \neg A) \vee (A \wedge B)) \vee B \equiv \neg(f \vee (A \wedge B)) \vee B \equiv (t \wedge \neg(A \wedge B)) \vee B \equiv \neg A \vee \neg B \vee B \equiv t$

C. Consider the following knowledge base (KB).

KB = $\{A, B, C, D, E, A \wedge B \wedge C \Rightarrow F, C \wedge F \wedge E \Rightarrow H\}$

Show $KB \models H$ by SLD resolution-refutation. (4 Points)

(답)

KB∪ $\neg H = \{A, B, C, D, E, A \wedge B \wedge C \Rightarrow F, C \wedge F \wedge E \Rightarrow H\}$

Transfer to CNF:

1) A, 2) B, 3) C, 4) D, 5) E,

6) $A \wedge B \wedge C \Rightarrow F \equiv \neg A \vee \neg B \vee \neg C \vee F$

7) $C \wedge F \wedge E \Rightarrow H \equiv \neg C \vee \neg F \vee \neg E \vee H$

8) $\neg H$

Resolution:

9) $\neg B \vee \neg C \vee F$ by (6, 1)

10) $\neg C \vee F$ by (9, 2)

11) F by (10, 3)

12) $\neg C \vee \neg E \vee H$ by (11, 7)

13) $\neg E \vee H$ by (12, 3)

14) H by (13, 5)

15) {}