AI Intro Homework #3

0516076 施威綸

1.

	→B	→C	→D	→E
A	75	15	-	-
B	-	-	250	-300

2.

(a) valid

(b) neither

(c) neither

(d) valid

(e) valid

(f) valid

(g) neither

3.

(a)	(b) CNF clauses
A	A
D	D
A∧D	A, D
A∧B⇔¬D	¬A∨¬B∨¬D, A∨D, B∨D
A∧D⇔¬B	¬A∨¬B∨¬D, A∨B, B∨D
B∧D⇔¬A	¬A∨¬B∨¬D, A∨B, A∨D
A∧B⇔¬C	¬A∨¬B∨¬C, A∨C, B∨C
A∧C⇔¬B	¬A∨¬B∨¬C, A∨B, B∨C
B∧C⇔¬A	¬A∨¬B∨¬C, A∨B, A∨C
C⇔¬B	¬B∨¬C, B∨C

$B \Leftrightarrow \neg C$	$\neg B \vee \neg C,\ B \vee C$

(c)

R1:A R2:D R3: $\neg A \vee \neg B \vee \neg D$ R4: $A \vee B$ R5: $A \vee C$ R6: $A \vee D$ R7: $B \vee C$

R8: $B \vee D$ R9: $\neg A \vee \neg B \vee \neg C$ R10: $\neg B \vee \neg C$

Resolution

(R1,R3) → $\neg B \vee \neg D$ (R11)

(R2,R11) → $\neg B$ (R12)

(R12,R7) → C (R13)

According to the clauses R1, R2, R12, R13, A, C, and D are true, and B is false.

4.

(a) $\forall x\ Safe(x) \Leftrightarrow \neg Pit(x) \wedge \neg At(Wumpus, x)$

$\forall x \exists y\ Pit(y) \wedge Adjacent(x, y) \Rightarrow Breezy(x)$

$\forall x \exists y\ At(Wumpus, y) \wedge Adjacent(x, y) \Rightarrow Smelly(x)$

$\forall x\ At(Wampus, x) \Rightarrow \neg Pit(x)$

$Safe(s11)$

(b) CNF:

1~3: $[\neg Safe(x) \vee \neg Pit(x)] \wedge [\neg Safe(x) \vee \neg At(Wumpus, x)] \wedge [Pit(x) \vee At(Wumpus, x) \vee Safe(x)]$

4: $\neg Pit(y) \vee \neg Adjacent(x, y) \vee Breezy(x)$

5: $\neg At(Wumpus, x) \vee \neg Adjacent(x, y) \vee Smelly(x)$

6: $\neg At(Wumpus, x) \vee \neg Pit(x)$

7.8: $Safe(s11) \longrightarrow \neg Breezy(s11) \wedge \neg Smelly(s11)$

9: $Smelly(s21)$

10: $Smelly(s12)$

11.12: $[\neg Smelly(x) \vee At(Wumpus, G(x))] \wedge [\neg Smelly(x) \vee Adjacent(x, G(x))]$

by R9. R11. R12 $\rightarrow$ $At(Wumpus, G(s21))$ -13

$Adjacent(s21, G(s21))$ -14

by R10. R11. R12 $\rightarrow$ $At(Wumpus, G(s12))$ -15

$Adjacent(s12, G(s12))$ -16

17: $\neg Adjacent(s21, z) \vee (z = s11) \vee (z = s31) \vee (z = s22)$

18: $\neg Adjacent(s12, z) \vee (z = s13) \vee (z = s11) \vee (z = s22)$

by R14. R17 $\rightarrow$ $(G(21) = s11) \vee (G(21) = s31) \vee (G(21) = s22)$

by R13 $\rightarrow$ $At(Wumpus, s11) \vee At(Wumpus, s31) \vee At(Wumpus, s22)$

$\therefore Safe(s11)$

by R16. R18 $\rightarrow$ $(G(12) = s13) \vee (G(12) = s11) \vee (G(21) = s22)$

by R15 $\rightarrow$ $At(Wumpus, s13) \vee At(Wumpus, s11) \vee At(Wumpus, s22)$

$\Rightarrow At(Wumpus, s22)$ ✗