

Quiz 5: CS4300 Name \_\_\_\_\_

Given the Wumpus board:

0	0	0	0
W	0	0	0
0	G	0	0
0	0	P	0

and the following set of conjuncts in the initial knowledge base:

1.  $[\sim B_{11} \vee P_{21} \vee P_{12}]$
2.  $[\sim P_{21} \vee B_{11}]$
3.  $[\sim P_{12} \vee B_{11}]$
4.  $[S_{B11} \vee W_{21} \vee W_{12}]$
5.  $[\sim W_{21} \vee S_{11}]$
6.  $[\sim W_{12} \vee S_{11}]$
7.  $[\sim B_{21} \vee P_{31} \vee P_{22} \vee P_{11}]$
8.  $[\sim P_{31} \vee B_{21}]$
9.  $[\sim P_{22} \vee B_{21}]$
10.  $[\sim P_{11} \vee B_{21}]$
11.  $[\sim S_{21} \vee W_{31} \vee W_{22} \vee W_{11}]$
12.  $[\sim W_{31} \vee S_{21}]$
13.  $[\sim W_{22} \vee S_{21}]$
14.  $[\sim W_{11} \vee S_{21}]$
15.  $[\sim B_{12} \vee P_{13} \vee P_{22} \vee P_{11}]$
16.  $[\sim P_{13} \vee B_{12}]$
17.  $[\sim P_{22} \vee B_{12}]$
18.  $[\sim P_{11} \vee B_{12}]$
19.  $[\sim S_{12} \vee W_{13} \vee W_{22} \vee W_{11}]$
20.  $[\sim W_{13} \vee S_{12}]$
21.  $[\sim W_{22} \vee S_{12}]$
22.  $[\sim W_{11} \vee S_{12}]$
23.  $[\sim P_{11}]$
24.  $[\sim W_{11}]$

answer the following questions.

1. Given the percept [0,0,0,0,0] at [1,1], what conjuncts are added to the knowledge base regarding gold, pits, wumpus, breezes and stench (number them as well)?

25. ~S11

26. ~B11

27. ~G11

2. Show how the safety of the cells neighboring [1,1] is decided using resolution theorem proving (i.e., show the theorems posed, and the sequence of resolutions leading to a conclusion).

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thm: ~P21  
28. P21    % add negated theorem  
  
29. B11    2,28  
30. []     26,29
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thm: ~P12  
28. P12    % add negated theorem  
  
29. B11    3,28  
30. []     26,29
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thm: ~W21  
28. W21    % add negated theorem  
  
29. S11    5,28  
30. []     25,29
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thm: ~W12  
28. W12    % add negated theorem  
  
29. S11    6,28  
30. []     25,29
```

Given these, add to KB:

- 28.  $\sim P_{21}$
- 29.  $\sim P_{12}$
- 30.  $\sim W_{21}$
- 31.  $\sim W_{12}$

3. Suppose the agent is at [2,1] where the percept is [0,1,0,0,0]; show what conjuncts are added to the knowledge base regarding gold, pits, wumpus, breezes and stench.

- 32.  $\sim S_{21}$
- 33.  $B_{21}$
- 34.  $\sim G_{21}$

4. Suppose the agent is at [1,2] where the percept is [1,0,0,0,0]; show what conjuncts are added to the knowledge base regarding gold, pits, wumpus, breezes and stench.

- 35.  $S_{12}$
- 36.  $\sim B_{12}$
- 37.  $\sim G_{12}$
- 38.  $\sim P_{22}$

5. Using all the knowledge accumulated in questions 1 to 4, determine whether or not the agent can prove  $\neg P_{22}$ , as well as  $\neg W_{22}$ , as well as  $G_{22}$ . Give details in favor or against. What knowledge (i.e., conjuncts) is needed to determine the presence of gold in a cell?

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thm:  $\sim W_{22}$

39.  $W_{22}$  % negate theorem

40.  $S_{21}$  13,39

41. [] 32,40

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thm:  $\sim P_{22}$

39.  $P_{22}$  % negate theorem

- 40. B12 17,39
- 41. [] 36,40

G22 cannot be proven until the agent enters the [2,2] cell. Since we do not use a Glitter logical variable, the only way for knowledge to be added is by using the percept for glitter in cell [x,y] to assert Gxy or to know that  $\sim$ Gxy for all other cells.