

Quiz 06

Question 1.

Consider the following axioms:

- a. All hounds howl at night.
- b. Anyone who has any cats will not have any mice.
- c. Light sleepers do not have anything which howls at night.
- d. John has either a cat or a hound.
- e. (Conclusion) If John is a light sleeper, then John does not have any mice.

Use Resolution to prove (or disprove) the Conclusion

Question 2.

Consider the following axioms:

- a. Every child loves Santa.
- b. Everyone who loves Santa loves any reindeer.
- c. Rudolph is a reindeer, and Rudolph has a red nose.
- d. Anything which has a red nose is weird or is a clown.
- e. No reindeer is a clown.
- f. Scrooge does not love anything which is weird.
- g. (Conclusion) Scrooge is not a child.

Use Resolution to prove (or disprove) the Conclusion

Question 3.

There are three suspects for a murder: Adams, Brown, and Clark.

Adams says "I didn't do it. The victim was old acquaintance of Brown's. But Clark hated him." Brown states "I didn't do it. I didn't know the guy. Besides I was out of town all the week." Clark says "I didn't do it. I saw both Adams and Brown downtown with the victim that day; one of them must have done it."

Assume that the two innocent men are telling the truth, but that the guilty man might not be. Write out the facts as sentences in Propositional Logic, and use propositional resolution to solve the crime.

Question 4.

Consider this Knowledge Base in propositional logic:

$$KB = \{A, B, A \vee C, K \wedge E \leftrightarrow A \wedge B, \neg C \rightarrow D, E \vee F \rightarrow \neg D\}$$

Check if these sentences are entailed by the KB:

a) $B \wedge C$?

b) $C \vee E \rightarrow F \wedge B$?

Question 5. Consider the following knowledge base of definite clauses.

1. $C \wedge D \rightarrow Y$

2. $R \wedge Z \rightarrow C$

3. $\neg B \vee D$

4. $\neg D \vee \neg R \vee Z$

5. B

6. $R \rightarrow D$

7. $D \rightarrow R$

Prove **Y** using backward chaining and forward chaining. In forward chaining, we only trigger a rule once for simplicity.

Question 6. Consider the following KB.

1. $\text{Buffalo}(x) \wedge \text{Pig}(y) \rightarrow \text{Faster}(x,y)$	4. $\text{Buffalo}(\text{Bob})$
2. $\text{Pig}(y) \wedge \text{Slug}(z) \rightarrow \text{Faster}(y,z)$	5. $\text{Pig}(\text{Pat})$
3. $\text{Faster}(x,y) \wedge \text{Faster}(y,z) \rightarrow \text{Faster}(x,z)$	6. $\text{Slug}(\text{Steve})$

Use forward chaining in first-order logic to prove **Faster(Bob, Steve)**. If several rules apply, use the one with the smallest number. Do not forget to indicate the unification at every step.