

REVIEW EXERCISE 05

Question 1. Given a knowledge base KB as follows, $\{P \rightarrow R, \neg S \rightarrow P, \neg S, R \rightarrow Q\}$. Consider the pseudo-code function PL-RESOLUTION given in the lecture to check whether KB entails Q.

Present your work to the table below, in which the first column contains $KB \wedge \neg\alpha$ in CNF, and every of the next columns includes new sentences added to KB after each loop. Note that

- Duplicated sentences are omitted from the table
- *Circle the unit clauses that lead to the contradiction and hence the function ends successfully, if possible*
- Process the clauses in order, that is first pair clause 1 with clause 2, 3, 4... then pair clause 2 with clause 3, 4,... and so on.

CNF sentences	Loop 1	Loop 2	Loop 3	Loop 4

Circle the correct option, IS or IS NOT.

Following the result of resolution, the sentence Q **IS / IS NOT** entailed by KB.

Question 2. Repeat Question 1. but this time you check whether KB entails $\neg Q$.

Question 3. Are the above problems solved by using Forward chaining or Backward chaining? Give your reason.

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Question 4. Consider the following text. "*Heather attended the meeting* or Heather was not invited. If *the boss wanted Heather at the meeting*, then *she was invited*. Heather did not attend the meeting. If the boss did not want Heather there, and the boss did not invite her there, then *she is going to be fired*."

Use resolution to prove that **Heather is going to be fired**. *Hint: clauses in italic are good candidates for propositions.*

Let each of following propositions denote the facts represented in the corresponding clause.

- Proposition A represents for "Heather attended the meeting."
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Then the propositional KB in CNF will be

- 1)
- 2)
- 3)
- 4)

Apply resolution to $KB \wedge \neg\alpha$

- 5) Negation of conclusion
- 6) from sentences and
- 7) from sentences and
- 8) from sentences and
- 9) • from sentences and

Conclusion: Therefore, Heather is going to be fired

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

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|--------------------------------|----------------------|
| 1. $C \wedge D \rightarrow Y$ | 5. B |
| 2. $R \wedge Z \rightarrow C$ | 6. $R \rightarrow D$ |
| 3. $\neg B \vee D$ | 7. $D \rightarrow R$ |
| 4. $\neg D \vee \neg R \vee Z$ | |

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