

CENG 424

Logic For Computer Science

Fall '2019-2020

Assignment 5

Regulations

1. Due date is 23 December 2019. Late submission is not allowed.
2. Submissions will be via OdtuClass, do not send your homework via e-mail, or do not bring any hardcopy.
3. You can use any typesetting tool (LaTeX, Word, etc.) or handwriting while writing the homework. However, you must upload the homework as a pdf file. Other formats will not be considered for grading.
4. Send e-mail to cseytan@ceng.metu.edu.tr if you need to get in contact.
5. This is an individual homework, which means you have to answer the questions on your own. Any contrary case will be considered as cheating and university regulations about cheating will be applied.

1 Question 1

Following axioms are given:

1. Every women likes every chocolate.
2. Anyone who likes some chocolate is not a coffee addict.
3. Anyone who drinks coffee with milk is a coffee addict.
4. Anyone who buys any coffee either drinks it with milk or with sugar.
5. Mary buys some coffee.
6. Milka is a chocolate.

According to the axioms above, conclude that:

If Mary is a woman then Mary drinks some coffee with sugar.

While reaching the conclusion, do the following:

1. Write down the sentences as relational logic sentences.

2. Convert them into clausal form using *inseado*.
3. Reach the conclusion by using resolution and show each step clearly.
4. Use the following formalism:
 - $WOMAN(x)$: x is a woman.
 - $LIKES(x, y)$: x likes y .
 - $CHOCOLATE(x)$: x is a chocolate.
 - $ADDICT(x)$: x is a coffee addict.
 - $COFFEE(x)$: x is a coffee.
 - $DWS(x, y)$: x drinks y with sugar.
 - $DWM(x, y)$: x drinks y with milk.
 - $BUY(x, y)$: x buys y .

2 Question 2

Following premises are given:

1. *Ali* is a sibling of *Veli*.
2. *Ali* is a child of *Mehmet*.
3. *Mehmet* is a child of *Hasan*.
4. *Hüseyin* is a grandchild of *Hasan*.

Prove that *Hüseyin* is a sibling of *Veli* by using *Answer Extraction Method*. Use the following formalism:

- $s(x, y)$: x and y are siblings.
- $c(x, y)$: x is a child of y .
- $g(x, y)$: x is a grandchild of y .

Moreover, the following relations are given:

- $s(x, y) \wedge s(x, z) \rightarrow s(y, z)$
- $c(y, x) \wedge c(z, x) \rightarrow s(y, z)$
- $c(y, x) \wedge c(x, z) \rightarrow g(y, z)$
- $g(y, z) \rightarrow c(y, x) \wedge c(x, z)$

Show each step of the proof clearly. Show each substitution clearly. For each step, do not forget to clarify line numbers of premises used.