Middle East Technical University   Department of Computer Engineering

CENG 424

Logic For Computer Science

Fall '2019-2020

Assignment 3

Regulations

1. Due date is 25 November 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. A template tex file will be provided to you if you prefer to use LaTex to write your solutions.

4. Send e-mail to cseylan@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.

Question 1

Following premises are given:

- $p \Rightarrow (q \Rightarrow r)$

- $p \Rightarrow q$

Show that $p \Rightarrow r$ is provable using the premises above. You can use rules of inferences as well as a complete logical axiomatization (e.g., Mendelson, Kleene, Standard, Meredith).

Question 2

Following premises are given:

- $p \Rightarrow (q \Rightarrow \neg r)$

- q

- $\neg t \Rightarrow r$

Show that $\neg(\neg p \lor \neg w) \Rightarrow t$ is provable using the premises above. You can use rules of inferences as well as a complete logical axiomatization (e.g., Mendelson, Kleene, Standard, Meredith).

Question 3

Use propositional resolution to prove the following sentence:

$$(p \wedge q \Rightarrow r) \Rightarrow (p \Rightarrow (q \Rightarrow r))$$

Question 4

Let $\Delta = \{p \Rightarrow q \wedge r, r \wedge s \Rightarrow t, \neg(p \vee q) \Rightarrow t, q \Rightarrow s \vee r, \neg(\neg q \Rightarrow t)\}$. Use resolution to show that $\Delta \vdash \{\}$.