Middle East Technical University Department of Computer Engineering

CENG 424

Logic For Computer Science

Fall '2020-2021

Assignment 2

Regulations

1. Due date is 27 November 2020. 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.

1 Question 1 (DLL)

Show the following formulas are satisfiable or not by using Davis-Longemann-Loveland method:

1. $(p \vee q \vee t) \wedge (\neg q \vee r) \wedge (\neg w \vee r) \wedge (\neg q \vee \neg r \vee t) \wedge w \wedge (q \vee t)$
2. $(\neg q \vee r \vee w) \wedge (\neg r \vee w) \wedge \neg w \wedge q \wedge p$

2 Question 2 (Semantic Tableaux)

1. Show unsatisfiability of the following formula by using semantic tableaux:

$$a \wedge d \wedge (c \vee \neg d) \wedge (b \vee \neg c \vee \neg d) \wedge (\neg b \vee \neg c)$$

2. Find out whether the following formula is true by using semantic tableaux:

$$p \Rightarrow (q \vee r) \equiv (s \wedge q) \Rightarrow ((p \wedge s) \Rightarrow r)$$

3 Question 3 (BDT and BDD)

The following formula is given:

$$\neg[(p \Rightarrow q) \wedge (p \wedge q \Rightarrow r)] \Rightarrow [p \Rightarrow r]$$

(a) Use splitting algorithm to draw the splitting tree of the given formula.

(b) Draw Binary Decision Tree (BDT) of the formula with the help of the splitting tree you built in (a).

(c) Draw Binary Decision Diagram (BDD) of the formula with the help of BDT you built (b). Your decision tree should not contain and redundant branches or subtrees.