Middle East Technical University Department of Computer Engineering

CENG 424

Logic For Computer Science

Fall '2020-2021

Assignment 1

Regulations

1. Due date is 13 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 (Splitting)

Suppose 4 people (A, B, C, and D) will have a bus trip and they will have seats in the same row of the bus. Each row consists of 4 seats numbered as 1, 2, 3, 4. While the seats 1 and 4 are near window, 2 and 3 are near aisle. However, there are some constraints to be satisfied about seating of those people in the row.

Write down the constraints below with propositional logic and analyze the case using splitting algorithm to find out whether they can seat or not.

1. A wants to have a seat near window.
2. B also wants to have a seat near window.
3. C accepts to have a seat near aisle only if he seats near A.
4. B and D do not want to sit together (They cannot seat on 1, 2 or on 3, 4 together side-by-side.).

Please use the following formalism while analyzing the case:
S1x: x seats on seat 1.
S2x: x seats on seat 2.
S3x: x seats on seat 3.
S4x: x seats on seat 4.

2 Question 2 (CNF)

Convert the following propositional formula into conjunctive normal form by explaining the solution step-by-step:

$$(p \Rightarrow r) \vee (q \iff r) \vee \neg(w \Rightarrow p)$$