

CENG 424

Logic For Computer Science

Fall '2019-2020

Assignment 1

Name Surname:

Student ID:

Regulations

1. Due date is 21 October 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.

1 Question 1 (Splitting)

Suppose 4 people, A, B, C, D will go from one place to another with a car. The car has 4 seats: The driver's seat, the front seat, and 2 backseats. However, those 4 people cannot get in the car randomly, there are some constraints to be satisfied so that they can go altogether.

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

1. A does not get on well with B and C, which means A cannot sit next to B or C (Please note that the driver's seat and the front seat are counted as next to each other. Also, backseats are counted as next to each other.).
2. C and D does not have a driver licence so they cannot sit on the driver's seat.
3. Only B and C knows the way so at least one of them should be on the front side of the car (the driver's seat or the front seat).

Use the following formalism while analyzing the case:

DSx: x seats on the driver's seat.

FSx: x seats on the front seat.

BRSx: x seats on the right back seat.

BSLx: x seats on the left back seat.

Note that x can be A, B, C, or D at a time.

2 Question 2 (CNF)

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

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