CS 301: Theory of Automata
Quiz 2
October 08, 2019.

Problem

Reduce the following string (Boolean formula) from 3SAT to SUBSET_SUM. Identify S and t.
$(x_1 \vee x_1 \vee x_2) \wedge (\sim x_1 \vee \sim x_2 \vee \sim x_3) \wedge (x_2 \vee x_2 \vee x_3)$
(here ~ is the not operator)

Solution

We construct the following table:

	x_1	x_2	x_3	c_1	c_2	c_3
x_1 (True)	1	0	0	1	0	0
x_1 (False)	1	0	0	0	1	0
x_2 (True)	0	1	0	1	0	1
x_2 (False)	0	1	0	0	1	0
x_3 (True)	0	0	1	0	0	1
x_3 (False)	0	0	1	0	1	0
c_1	0	0	0	1	0	0
c_1	0	0	0	1	0	0
c_2	0	0	0	0	1	0
c_2	0	0	0	0	1	0
c_3	0	0	0	0	0	1
c_3	0	0	0	0	0	1

In the above table each row is a member of S (we do not include the header row and header column in the string).
t = 111333.

Important note: It would be incorrect to say that S = {100100,100010,...} as the ellipses (...) in a set indicate an infinite set. You can simply say that each row of the table is a member of S.