Title: **NAND-NAND Implementation of Boolean Functions**

Objective: It shows the possibility to realize Boolean functions using NAND gates only.

Task 1: Implement the Boolean function $F(A,B,C) = \sum 1,5,6,7$, using one digital integrated circuit, type 7400.

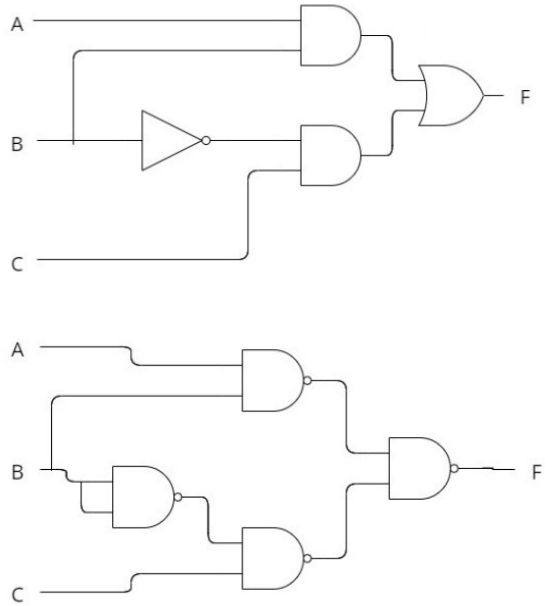
Procedure:

1. Find the equivalent Boolean expression of F.
2. Find the truth-table of F.
3. Use Boolean algebra to minimize F, to the minimum number of literals.
4. Use DeMorgan's theorem to represent F, using 4 NAND operations only.
5. Connect the resulting circuit using 7400 IC.

F = (A' B' C) + (A B' C) + (A B C') + (A B C)

= (A' + A) (B' C) + (A B) (C' + C) = (B' C) + (A B)

m	A B C	F
0	0 0 0	0
1	0 0 1	1
2	0 1 0	0
3	0 1 1	0
4	1 0 0	0
5	1 0 1	1
6	1 1 0	1
7	1 1 1	1



(3 marks)

Additional tasks:

- Implement 2-input XOR gate, i.e. $X \oplus Y$, using one 7400 IC only (show how)
- Implement 3-input NAND gate, i.e. $\overline{(A\ B\ C)}$, using one 7400 IC. (2 marks)
- Implement $F = (A\ B) \oplus (C\ D)$ using two 4700 ICs. (5 marks)