

1. Draw logic circuit corresponding to the follow Boolean expressions:

- $z = \overline{(A + B + \overline{CDE})} + \overline{BCD}$
- $x = MN(P + \overline{N})$

2. Simplify the following expressions using DeMorgan 's theorem:

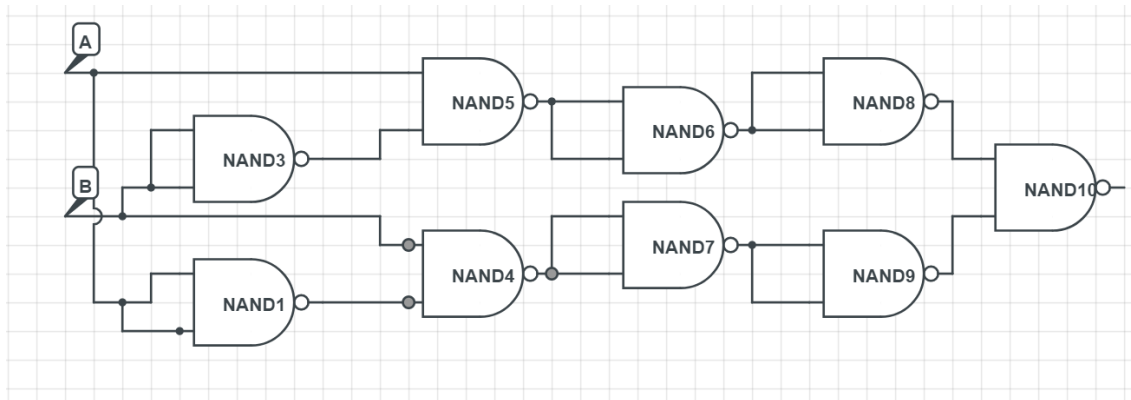
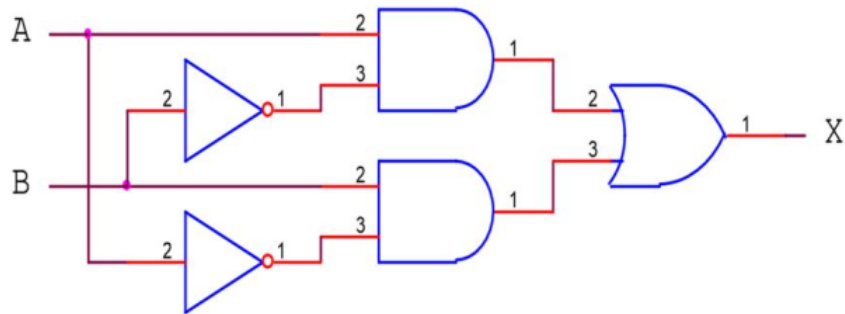
- $X = \overline{A(B + \overline{C})D}$
- $Y = \overline{\overline{A} \overline{B} \overline{C} \overline{D}}$

3. Simplify the following expressions:

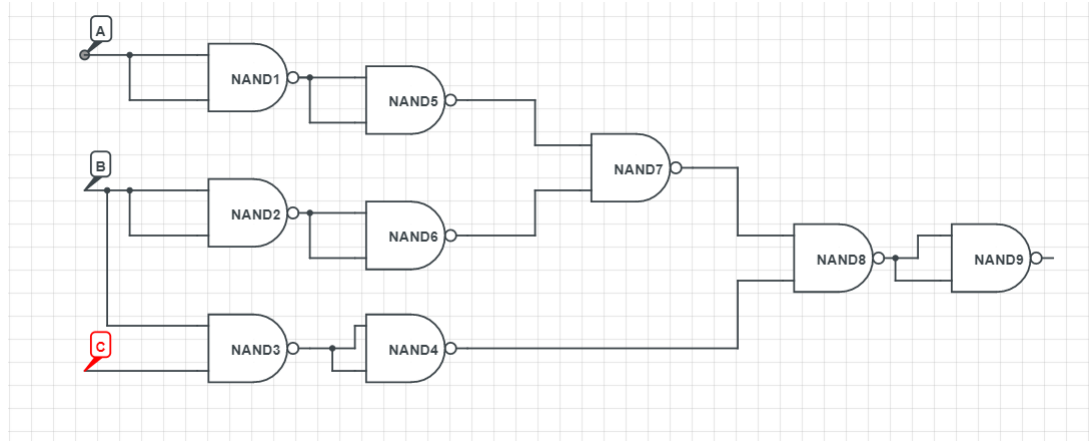
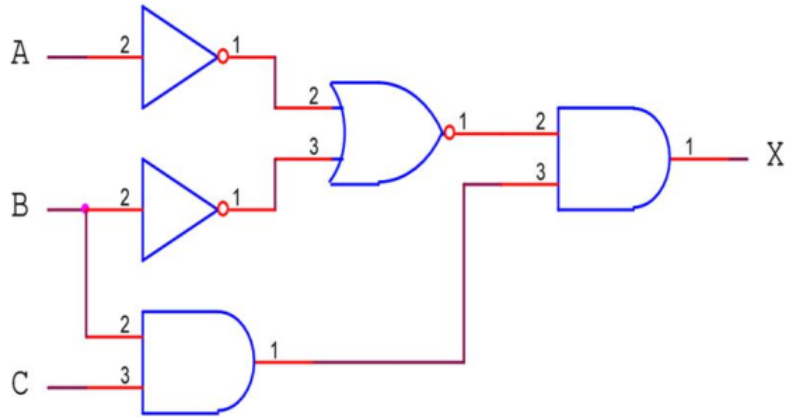
- $X = \overline{A}BCD + A \overline{B} \overline{C} \overline{D} + A \overline{B} (\overline{C} + D) + A (\overline{B} + \overline{C})D + A (\overline{B} + \overline{C} + \overline{D} + B \overline{C}) + ABC$
- $Y = \overline{A}C \overline{D} + A \overline{B} \overline{C} + (\overline{C} + D) + \overline{A} \overline{B}CD + (\overline{A} + \overline{C})\overline{D}$

4. Exercise 10: Transform the following circuits using only NAND gates:

- a)

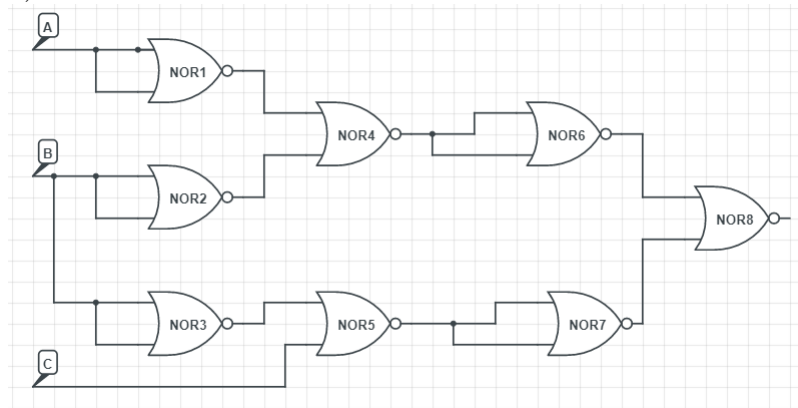


- b)

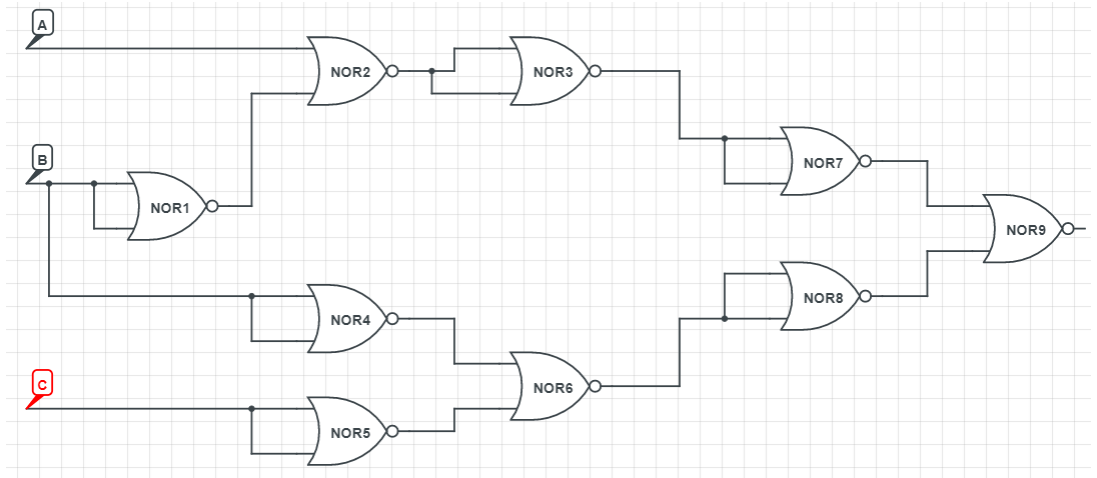


5. Exercise 11: Transform the following circuits using only NOR gates:

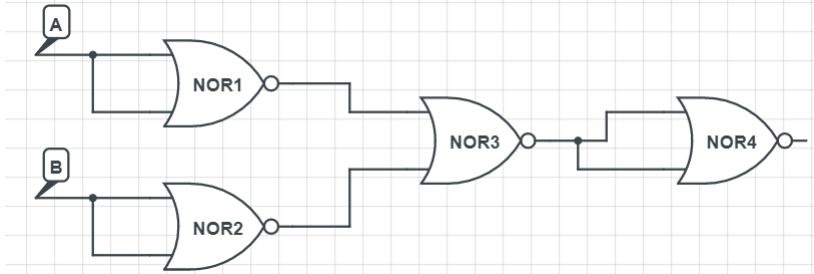
- a)



- b)



6. Exercise 12: Build a 2-input NAND gate using only 2-input NOR gates:



7. Exercise 13: Build a 2-input NOR gate using only 2-input NAND gates:

