1. *Perfect induction* is an approach to prove Boolean theorems. In this approach, the theorem needs to be checked to be true for every input combination of values (a truth table can be used here). Use perfect induction to prove the following theorems:

    a) T3 (Idempotency): $X+X=X$

    b) T7 (Associativity): $(X+Y)+Z = X+(Y+Z)$

    c) T8D (Distributivity): $(X+Y) \cdot (X+Z) = X+YZ$

    d) T9 (Covering): $X+XY = X$

2. Assuming that theorems T1 to T8, in the Table of Switching-Algebra Theorems, are true, prove the covering theorem (T9) and the consensus theorem (T11), without using perfect induction. List the theorems you use in each step.

3. Use the DeMorgan's Law to find the complement of the expressions below

    a) $(X+VW')Y+Z'$

    b) $(X+Y'+Z)(X'Y'+Z)(X+Y'Z')$

4. Show that each of the following equality holds:

    a) $Y+X'Z+XY' = X+Y+Z$

    b) $X'Y'+Y'Z+XZ+XY+YZ' = X'Y'+XZ+YZ'$

    c) $X\,YZ'+ YZ'W'+YZ+Z'W = Y+Z'W$

5. The truth table below describes two Boolean functions F(X, Y, Z) and G(X, Y, Z).
Answer the following questions:

      a) List the minterms for F(X, Y, Z), G(X, Y, Z), F′ (X, Y, Z) and G′(X, Y, Z)

      b) List the maxterms for F(X,Y, Z) and G(X, Y, Z)

      c) List the minterms for F(X, Y, Z)+G(X,Y,Z)   and F(X, Y, Z).G(X,Y, Z)

      d) Express F(X, Y,Z) and G(X, Y, Z) in sum of minterms algebraic form.

Row	X	Y	Z	F(X, Y, Z)	G(X, Y, Z)
0	0	0	0	0	1
1	0	0	1	1	0
2	0	1	0	1	1
3	0	1	1	0	0
4	1	0	0	1	1
5	1	0	1	0	0
6	1	1	0	1	0
7	1	1	1	0	1

6.   Find sum-of-minterms and product-of-maxterms for the following expressions:

    a.   F(X,Y,Z)= Y′Z′+X
    b.   F(X,Y,Z)= Y′Z+X+ YZ′
    c.   F(X,Y,Z)= X+YZ+ X′Y