1. Complete the following equations:

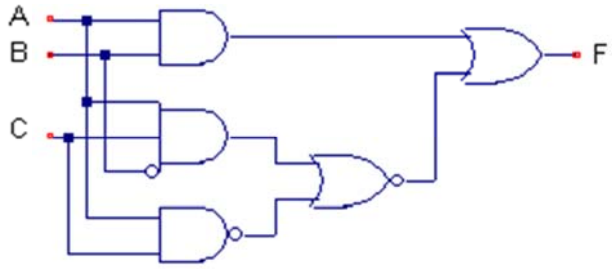
   $X + 1 =$ $X + X =$ $X.0 =$ $X.1 =$ $X + 0 =$ $X + \overline{X} =$

2. Use a truth table to prove that $X.Y + \overline{X}.Z + Y.Z = X.Y + \overline{X}.Z$

3. Simplify the Boolean expression $F = (X + Y)(X + Z)$

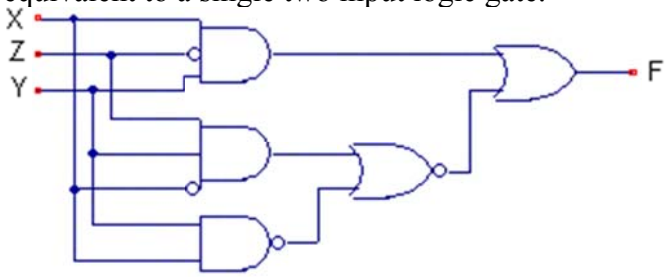
4. Find the truth table for the function $F = X.Y + X.\overline{Y} + Y.\overline{Z}$ and use it to express F as a sum of minterms and a product of maxterms.

5. Describe the circuit below using a maxterm list.



6. Apply De Morgan's Theorem to $F = \overline{A.\overline{B}.(C + \overline{D})}$

7. Find an expression for the logic circuit below. Simplify this to show that the circuit is equivalent to a single two input logic gate.



8. An aircraft safety system accepts three binary signals X, Y, Z. The output warning light comes on (W = '1') when:

   $X = Y$ and $X \neq Z$ or
   $X = Z$ and $X \neq Y$

   Find the truth table for this system and express it as a canonical product-of-sums.

9. Write down the truth table for the exclusive OR function and hence obtain a logic expression for it.

10. Express the exclusive NOR function as a Product of Sums.