**Q:1 Verify following Rules of Boolean Algebra by designing them using Circuit Makers.**

**1**: **Identity Law**

**2: Idempotent Law**

**3: Complement Law**

**4: Involution Law**

**5:** **Commutative Law**

**6: Associative Law**

**7: Distributive Law**

**Q:2 Simplify the expressions**

**1: F = (A + (BC)’)’**

**ANS F = [A]’ [(BC)’]’**

**F = A’BC**

**2: F = (AB+CD)’**

**ANS F = (AB)’(CD)’**

**Simplified**

**Q:3 Use DE Morgan’s Theorem to prove that this NAND gate circuit performs the exact same function:**

**SOL:**

**F = [(AB)’ (CD)’]’ BREAKING LONGEST COMPLIMENT**

**F = [(AB)’]’ + [(CD)’]’ COMPLIMENT LAW**

**F = AB+CD**

**Q:4 Apply the principles of DE Morgan’s theorems to the simplification of a gate circuit:**

**Y1 = [A(B+C)]’**

**Y2 = B+C**

**Y3 = B’**

**Y4 = (AB’)’**

**Y5 = [ {A(B+C)}’ + (AB’)’ ]’**

**SOL:**

**= [ {A (B+C)}’ + (AB’)’ ]’ //BREAKING LONGEST COMPLIMENT**

**= [ {A (B+C)}’ ]’ . [ (AB’)’ ]’ //COMPLIMENT LAW**

**= [A(B+C)] . (AB’) //DISTRIBUTIVE LAW**

**= (AB + AC) . AB’ //MULTIPLYING**

**= (AB’)(AB) + (AB’)(AC) //A.A=A , B.B’=0**

**= A(0) +AB’C**

**= AB’C**