Sardar Vallabhbhai Patel Institute of Technology, Vasad

Digital Fundamentals

Assignment 3

Simplification of Boolean Expression

1. Implement the Boolean functions.(a) xyz+x'y+xyz' (b) (A+B)'(A'+B')' and

   F= xy+xy'+y'z with logic gates.

2. Obtain the simplified expression in sum of product for the following Boolean functions.
   (a) F= Σ(0,1,4,5,10,11,12,14) and(b) F=Σ(11,12,13,14,15).

3. Implement the functions F=Σ(1,3,7,11,15) with don't care conditions d=Σ(0,2,5) Discuss the effect of don't care conditions

4. Find the complement of the following Boolean function and reduce to a minimum number of literals.

   B'D + A'BC' + ACD + A'BC

5. Obtain the simplified expressions in sum of products using K-map:

   x'z + w'xy' + w(x'y + xy')

6. Given Boolean function

   F= x y + x' y' + y' z

   1. Implement it with only OR & NOT gates
   2. Implement it with only AND & NOT gates

7. Determine the Prime Implicants of following Boolean Function using Tabulation Method.

   F(A,B,C,D,E,F,G)=Σ(20,28,38,39,52,60,102,103,127)

8. Simplify the following Boolean function using K-Map.

   F=A'B'C'+B'CD'+A'BCD'+AB'C'

9. Simplify the following Boolean function by using K-Map.

   F = Σ (0,1,2,8,10,11,14,15)

10. Simplify Boolean function F (w,x,y,z) = Σ (0,1,2,4,5,6,8,9,12,13,14) using K-map and Implement it using (i) NAND gates only (ii) NOR gates only.

11. Simplify the following Boolean function using K-Map and draw logic diagram using NOR gates only.F(w,x,y,z) = Σ(0 ,1 , 2 , 8 ,10 ,11,14,15)

12. Simplify the Boolean function:

   (1)F(w,x,y,z) = Σ (0,1,2,4,5,6,8,9,12,13,14)
   (2)F(w,x,y) = Σ (0,1,3,4,5,7)

13. Explain with figures how NAND gate and NOR gate can be used as Universal gate.

14. Simplify the Boolean function:

   (1) F = A'B'C'+B'CD'+A'BCD'+AB'C'
   (2) F =A'B'D'+A'CD+A'BC

d=A'BC'D+ACD+AB'D' Where "d " indicates Don't care conditions.

15. Obtain the simplified expressions in sum of products for the following Boolean functions:

      (i) $F(A,B,C,D,E) = \Sigma(0,1,4,5,16,17,21,25,29)$

      (ii)   A'B'CE' + A'B'C'D' +B'D'E' + B'C D

16. The Boolean expression BE + B'DE' is a simplified version of expression A'BE+BCDE + BC'D'E + A'B'DE' + B'C'DE'. Are there any don't care condition? If so what are they?

17. Simplify the Boolean functions using K- map

      $F(A,B,C,D,E,F) = \Sigma(6,9,13,18,19,25,27,29,41,45,57,61)$.

      $F(A,B,C,D,E,F,G)= \Sigma(20,28,52,60)$

18. Implement the following Boolean functions using Don't care conditions.

      a) $F(A,B,C,D) = \Sigma(0,1,2,9,11)\ d(A,B,C,D) = \Sigma(8,10,14,15)$

      b) F= B'D + B'C +ABCD d= A'BD+ AB'C'D'