

**EE 2000 Logic Circuit Design**  
**Semester B 2023/24**

Tutorial 2

1. (a) Use a K-map to convert the following canonical SOP expression into a minimum POS expression.  
 $f(a,b,c,d) = \sum m(0,1,5,6,8,10,13,14)$   
  
(b) Use a K-map to convert the following canonical POS expression into a minimum SOP expression.  
 $f(a,b,c,d) = \prod M(0,2,5,6,8,9,13)$
2. (a) Plot the following functions on the K-map.  
    (i)  $f(x, y, z) = \sum m(0, 1, 3, 7)$   
    (ii)  $f(a, b, c, d) = \sum m(2, 4, 6, 7, 14)$   
(b) Identify the prime implicants and the essential prime implicants for the answers.  
(c) Find the simplest SOP form of the above functions from the K-maps.  
(d) Find the simplest POS form of the above functions from the K-maps.
3. (a) Plot the following function on the K-map.  
 $f(A, B, C, D) = (A' + B' + C + D)(A + B' + C + D)(A + B + C + D')(A + B + C' + D')(A' + B + C' + D)(A + B + C' + D)$   
  
(b) Convert the standard POS expression in part (a) into  
    (i) Minimum POS expression.  
    (ii) Canonical sum expression.  
    (iii) Minimum SOP expression.
4. Simplify the following function to SOP form using Q-M method:  
 $f(a,b,c,d) = \sum m(4, 5, 6, 8, 11, 13, 14) + \sum d(2, 10, 15)$