

**5.3** Simplify the following sum of products functions using K-map method.

(a)  $F(A, B, C, D) = \sum (0, 1, 2, 3, 7, 8, 9, 10, 11, 12, 13)$

(b)  $F(A, B, C, D) = \sum (0, 2, 4, 6, 8) + \sum_{d.c.} (10, 11, 12, 13, 14, 15)$

(c)  $F(A, B, C, D) = \sum (0, 2, 4, 9, 12, 15) + \sum_{d.c.} (1, 5, 7, 10)$

(d)  $F(A, B, C, D) = \sum (0, 3, 4, 5, 6, 7, 8, 13, 14)$

(e)  $F(A, B, C, D) = \sum (4, 6, 7, 9, 10, 11, 12, 14, 15)$

(f)  $F(A, B, C, D) = \sum (0, 1, 2, 3, 4, 6, 7, 8, 9, 11, 15)$

(g)  $F(A, B, C, D) = \sum (1, 3, 4, 5, 7, 8, 9, 11, 14, 15)$

(h)  $F(A, B, C, D) = \sum (1, 2, 3, 4, 5, 6, 13, 14, 15)$

(i)  $F(A, B, C, D) = ABC'D + A'BCD + A'B'C' + A'B'D' + AC' + AB'C + B'$

(j)  $F(A, B, C, D) = \sum (1, 3, 7, 11, 15) + \sum_{d.c.} (0, 2, 5)$

(k)  $f(x, y, z) = x'y'z + x'yz' + xy'z' + xy'z$

(l)  $F(A, B, C) = A'C + A'B + AB'C + BC$

(m)  $F(A, B, C, D) = A'B'C' + B'CD' + A'BCD' + AB'C'$

(n)  $F(A, B, C, D) = \sum(3, 4, 5, 7, 9, 13, 14, 15)$

(o)  $F(A, B, C, D) = \sum(0, 1, 2, 3, 5, 7, 8, 9, 11, 14)$

**5.4** Simplify the following product of sums functions using K-map method.

(a)  $F(A, B, C, D) = \prod(1, 4, 5, 6, 11, 12, 13, 14, 15)$

(b)  $F(A, B, C, D) = \prod(4, 5, 6, 7, 8, 12) \cdot \prod_{d.c.}(1, 2, 3, 9, 11, 14)$

(c)  $F(A, B, C, D) = (A + B + C' + D')(A' + C + D')(A' + B + C' + D')$   
 $(B' + C)(B' + C')(A + B')(B' + D')$