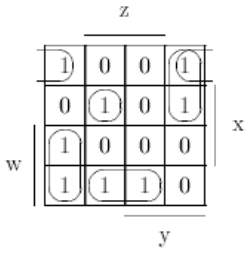
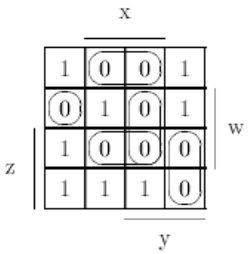
CS M51A, Sec. 1, Class Exercises No. 5 - SOLUTIONS

Exercise 5.6

(a) $E(w,x,y,z) = \prod M(1,3,4,7,10,13,14,15) = \sum m(0,2,5,6,8,9,11,12)$

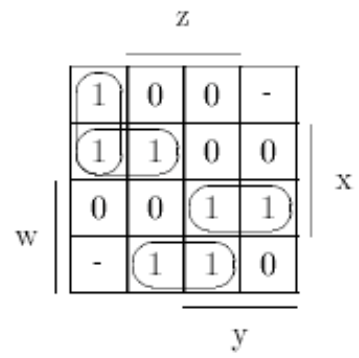


minimal sum of products: $wy'z' + wx'z + w'x'z' + w'yz' + w'xy'z$

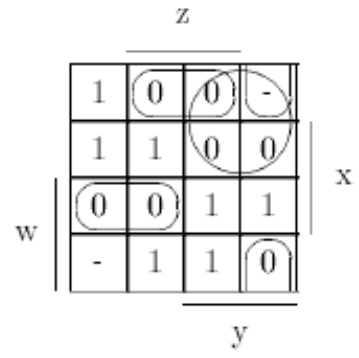


minimal product of sums: $(w + x + z')(w' + y' + z)(x' + y' + z')(w' + x' + z')(w + x' + y + z)$

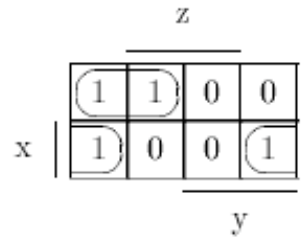
(b)$E(w,x,y,z) = \sum m(0,4,5,9,11,14,15), dc(w,x,y,z) = \sum m(2,8)$



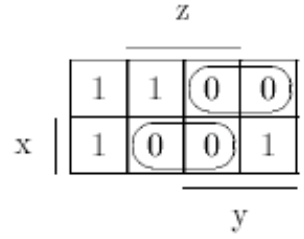
minimal SP: $w'y'z' + w'y'x + wx'z + wxy$



minimal PS: (w+x+z')(w+y')(x+y'+z)(w'+x'+y)
(c) $E(x,y,z) = \sum m(0,1,4,6) = \prod M(2,3,5,7)$

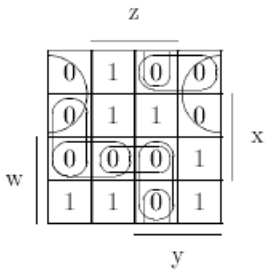


minimal sum of products: $x'y' + xz'$



minimal product of sums: $(x + y')(x' + z')$

Exercise 5.7
$f(w,x,y,z) = one\_set(1,5,7,8,9,10,14)$



(a) prime implicates are:
$(w+z),(w+x+y'),(x+y'+z'),(w'+y'+z'),(w'+x'+z'),(w'+x'+y),(x'+y+z)$
(b) essential prime implicate is: $(w+z)$
(c) a minimal product of sums expression that implements $f(w,x,y,z)$ is:

$$E(w,x,y,z) = (w+z)(x+y'+z')(w'+x'+z')(x'+y+z)$$

the solution is not unique because there are other ways to cover the 0-cells (not covered by the essential prime implicate) with the same number of terms.