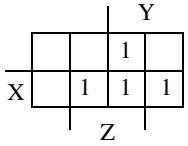
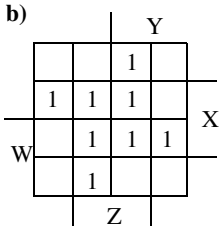
2-18.*

a)



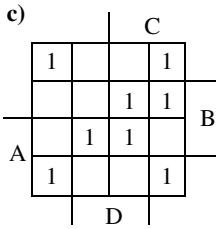
$\Sigma m(3, 5, 6, 7)$

b)



$\Sigma m(3, 4, 5, 7, 9, 13, 14, 15)$

c)



$\Sigma m(0, 2, 6, 7, 8, 10, 13, 15)$

2-19*

a) *Prime* = $XZ, WX, \bar{X}\bar{Z}, W\bar{Z}$
Essential = $XZ, \bar{X}\bar{Z}$

b) *Prime* = $CD, AC, \bar{B}\bar{D}, \bar{A}BD, \bar{B}C$
Essential = $AC, \bar{B}\bar{D}, \bar{A}BD$

c) *Prime* = $AB, AC, AD, B\bar{C}, \bar{B}D, \bar{C}D$
Essential = $AC, B\bar{C}, \bar{B}D$

2-22.*

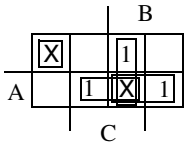
a) s.o.p. $CD + A\bar{C} + \bar{B}D$
p.o.s. $(\bar{C} + D)(A + D)(A + \bar{B} + C)$

b) s.o.p. $\bar{A}\bar{C} + \bar{B}\bar{D} + A\bar{D}$
p.o.s. $(\bar{C} + \bar{D})(\bar{A} + \bar{D})(A + \bar{B} + \bar{C})$

c) s.o.p. $\bar{B}\bar{D} + \bar{A}BD + (\bar{A}BC \text{ or } \bar{A}C\bar{D})$
p.o.s. $(\bar{A} + \bar{B})(B + \bar{D})(\bar{B} + C + D)$

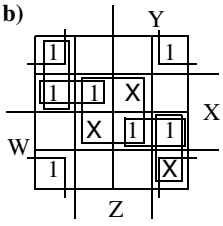
2-25.*

a)



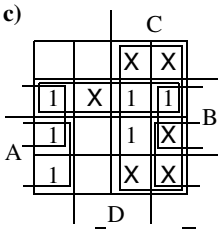
Primes = $AB, AC, BC, \bar{A}\bar{B}\bar{C}$
Essential = AB, AC, BC
$F = AB + AC + BC$

b)



Primes = $\bar{X}\bar{Z}, XZ, \bar{W}X\bar{Y}, WXY, \bar{W}\bar{Y}\bar{Z}, WY\bar{Z}$
Essential = $\bar{X}\bar{Z}$
$F = \bar{X}\bar{Z} + \bar{W}X\bar{Y} + WXY$

c)



Primes = $\bar{A}B, C, A\bar{D}, B\bar{D}$
Essential = $C, A\bar{D}$
$F = C + A\bar{D} + (B\bar{D} \text{ or } \bar{A}B)$

2-30.*

$X \oplus Y = X\bar{Y} + \bar{X}Y$

Dual $(X \oplus Y)$ = Dual $(X\bar{Y} + \bar{X}Y)$

$= (X + \bar{Y})(\bar{X} + Y)$

$= \bar{\bar{X}}Y + X\bar{\bar{Y}}$

$= \overline{X\bar{Y} + \bar{X}Y}$

$= \overline{X \oplus Y}$