ITI1100Z

Professor: Qi Hao

Assignment # 3

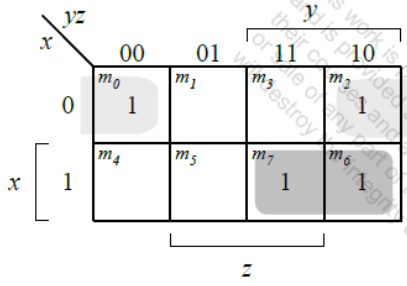
Submission Deadline June 9, 2018 midnight (11h59 PM), Brightspace

From the textbook Chapter 3 pages 140-142 in the 6th edition, solve the following problems

3.3(a)(b)(c)(d), 3.4(e)(f), 3.5(c)(d), 3.7(c)(d), 3.8(c)(d), 3.10(c)(d)(f), 3.12(a), 3.13(c), 3.15(c)(d), 3.16(b)(c), 3.18, 3.20(a)

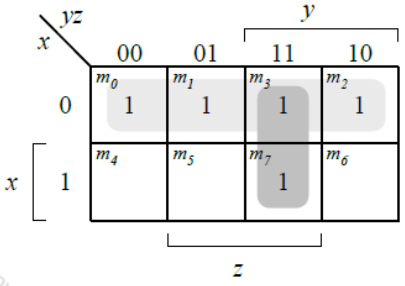
3.3

Total
4 points



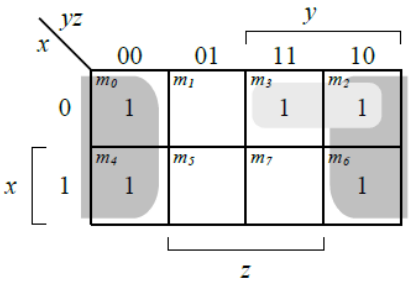
(a) $F = xy + x'y'z' + x'yz'$

$F = xy + x'z'$



(b) $F = x'y' + yz + x'yz'$

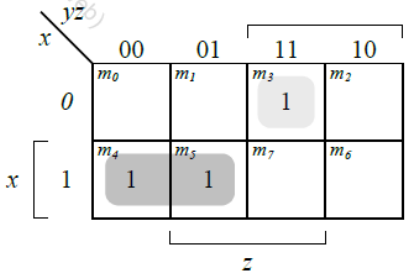
$F = x' + yz$



$F = x'y + yz' + y'z'$

$F = = x'y + z'$

(c)



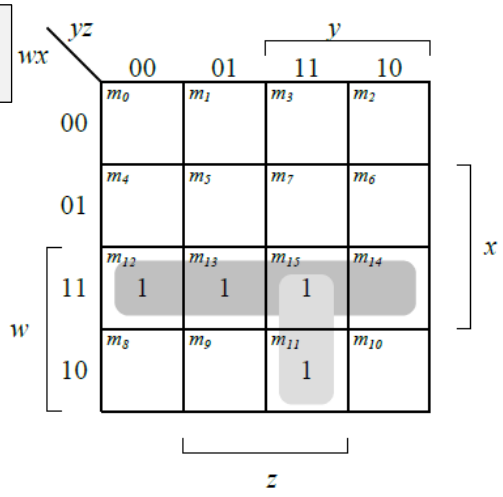
$F = x'yz + xy'z' + xy'z$

$F = x'yz + xy'$

(d)

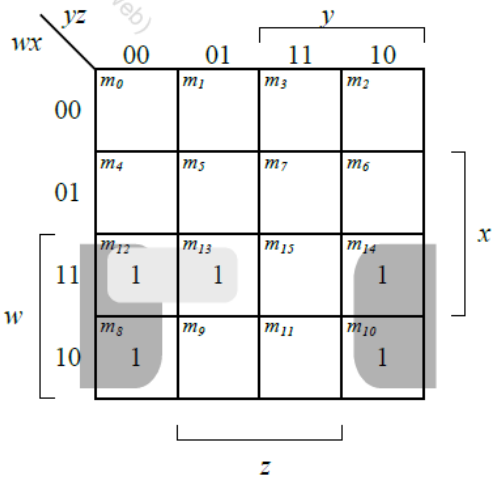
3.4

Total
2 points



$F = wx + wyz$

(e)

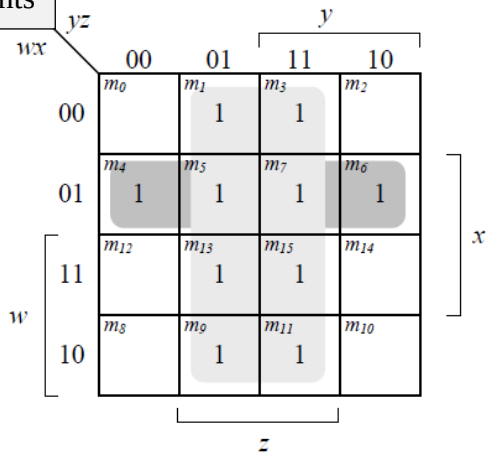


$F = wz' + xy'w$

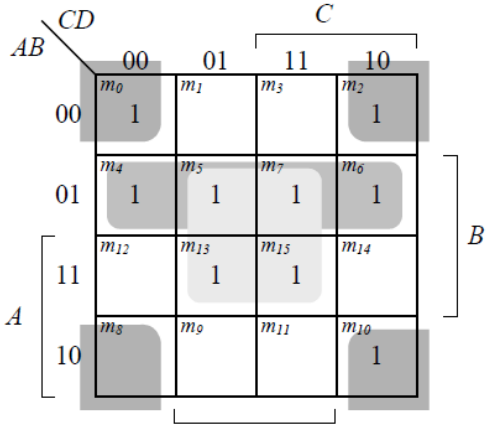
(f)

3.5

Total
2 points



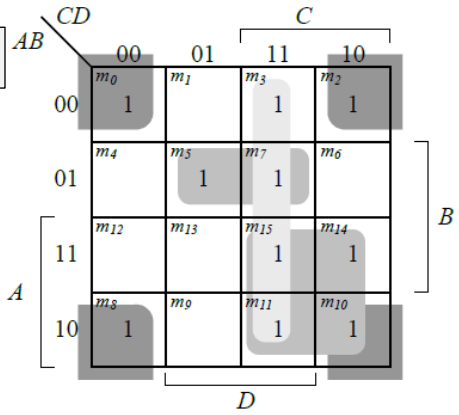
(c) $F = z + xw'$



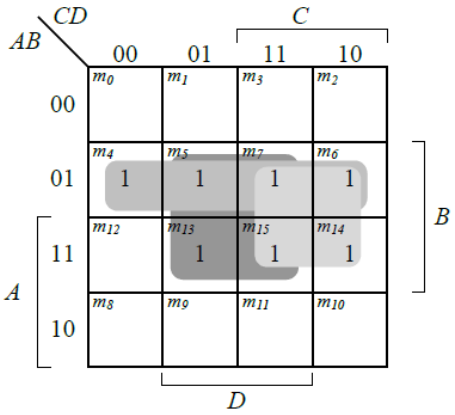
(d) $F = BD + A'B + B'D'$
$or = BD + B'D' + A'D'$

3.7

2 points

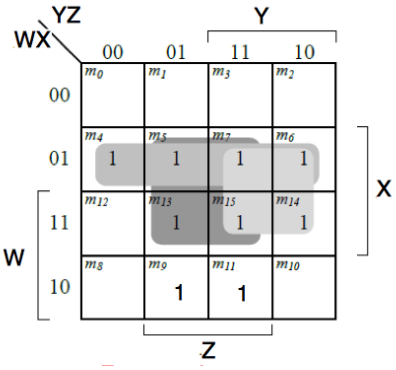


(c) $F = B'D' + AC + A'BD + CD$ (or $B'C$)



(d) $F = A'B + BD + BC$

Error in (d). Correction:

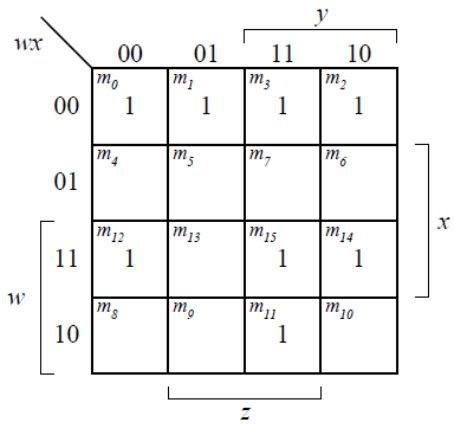


(d) $F = w'x + wz + xy$

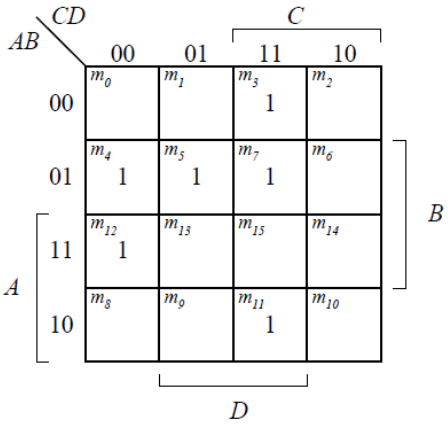
3.8

Total
2 points

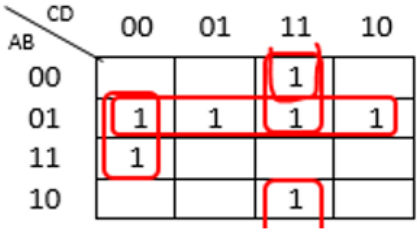
(c) $F = \Sigma(0, 1, 2, 3, 11, 12, 14, 15)$



(d) $F = \Sigma(3, 4, 5, 7, 11, 12)$



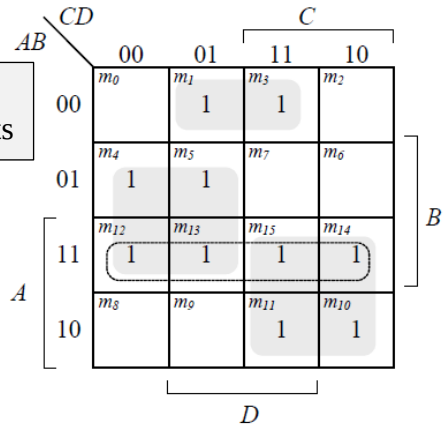
(d) Error. Correction:



$$F(A, B, C, D) = \sum(3, 4, 5, 6, 7, 11, 12)$$

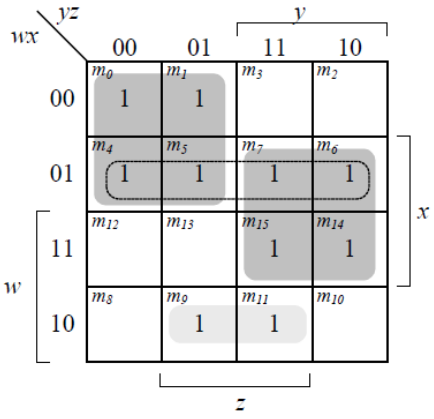
3.10

Total
6 points



F = Σ(1, 3, 4, 5, 10, 11, 12, 13, 14, 15)
Essential: AC, BC', A'B'D
Non-essential: *AB, A′B′D, B′CD, A′C′D*
F = AC + BC′ + A′B′D

(c)

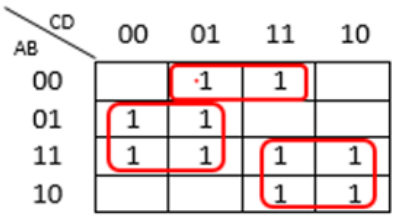


F = Σ(0, 1, 4, 5, 6, 7, 9, 11, 14, 15)
Essential: *w'y', xy, wx'z*
Non-essential: *wx, x'y'z, w'wz, w'x'z*
F = *w'y' + xy + wx'z*

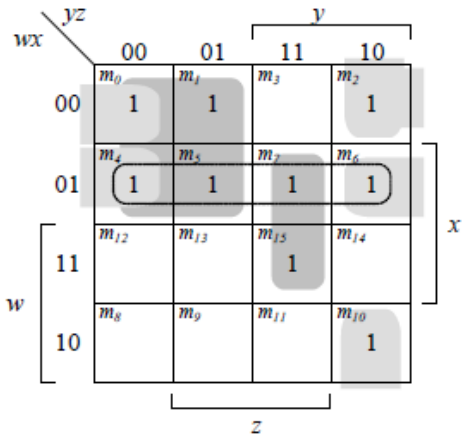
(d)

(c) Error. The correction is:

c)



$$F = BC' + AC + A'B'D$$
$$Essential: BC', AC$$



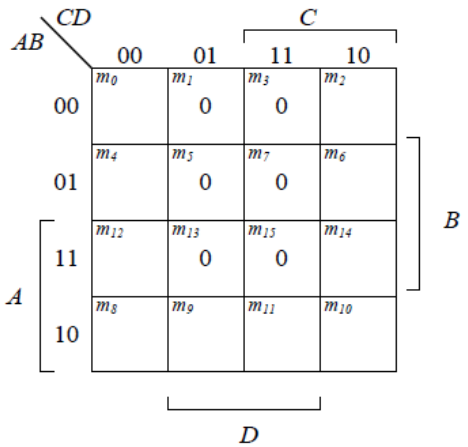
F = S(0, 1, 2, 4, 5, 6, 7, 10, 15)
Essential: *w'y', w'z', xyz, x'yz'*
Non-Essential: *w'x*
F = w'y' + w'z' + xyz + x'yz'

(f)

3.12

$F = \Pi(1, 3, 5, 7, 13, 15)$
$F' = A'D + B'D$ ← $F' = A'D + BD$
$F = (A + D')(B' + D')$
$F = C'D' + AB' + CD'$

Total
2 points



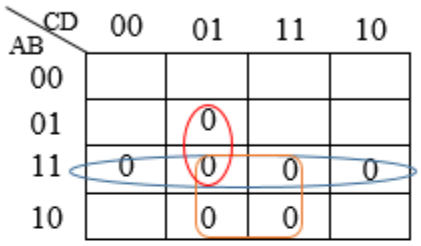
3.13

Total
3 points

c) The answer in the solution manual is wrong. The correct answer is as the follows:

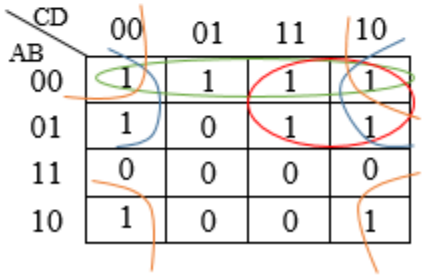
$$F = (A' + B + D')(A' + B' + C')(A' + B' + C)(B' + C + D')$$

$$F' = AB'D + ABC + ABC' + BC'D$$



$$F' = AB + AD + BC'D$$

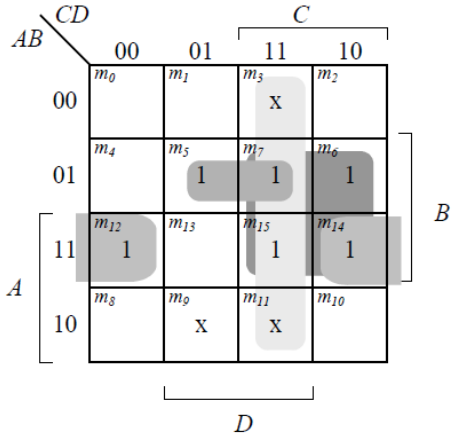
$$F = (A' + B')(A' + D')(B' + C + D')$$



$$F = A'B' + A'C + A'D' + B'D'$$

3.15

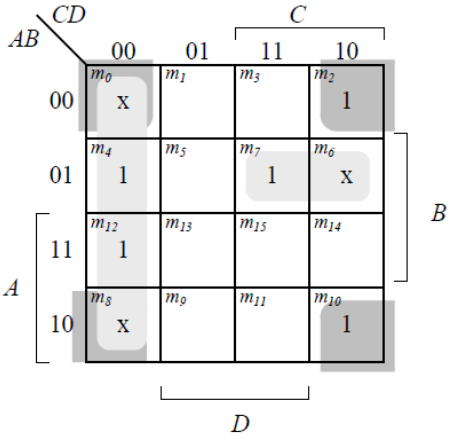
Total
4 points



$F = BC + CD + ABD' + A'BD$

$F = \Sigma(3, 5, 6, 7, 11, 12, 14, 15)$

(c)



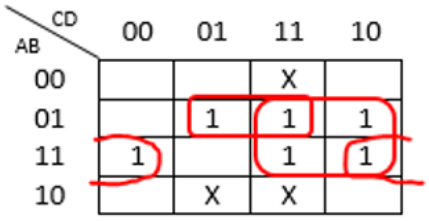
$F = B'D' + C'D' + A'BC$

$F =$ $F = \Sigma(0, 2, 4, 6, 7, 8, 10, 12)$

(d)

(c) has error. Correction is:

c)

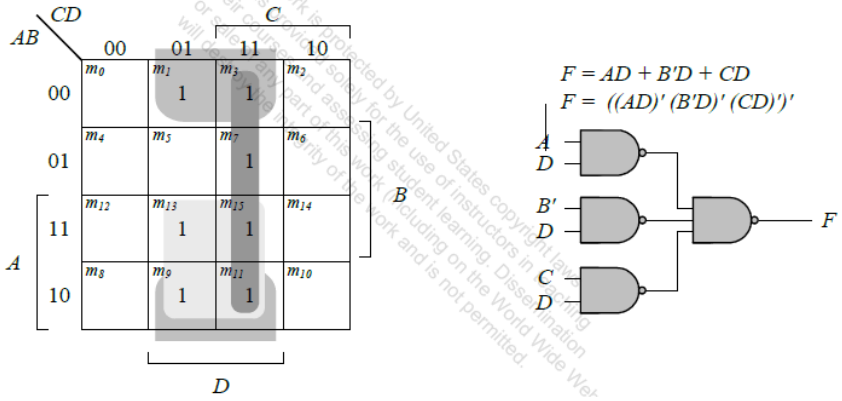


$$\boldsymbol{F = BC + A'BD + ABD' = \sum(5, 6, 7, 12, 14, 15)}$$

3.16

Total
4 points

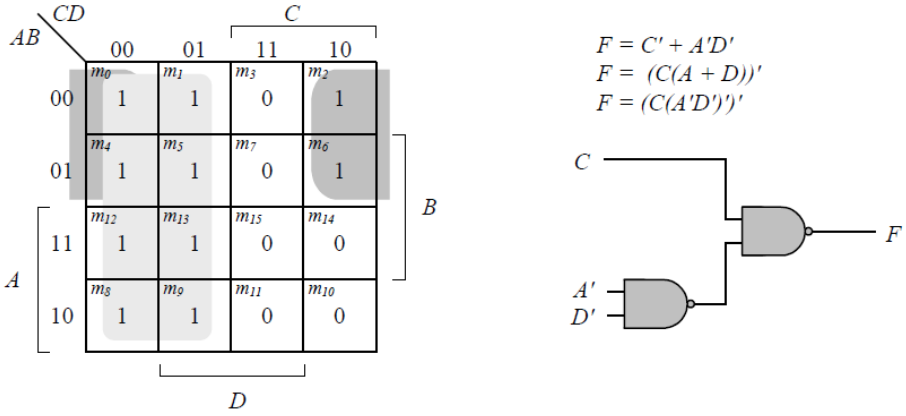
(b)



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

$F' = (A' + C' + D')' + (A' + C')' + (C' + D')'$

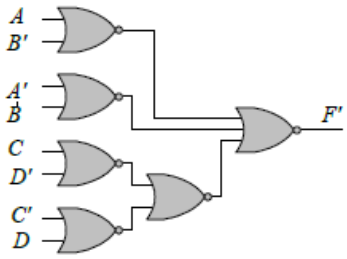
$F' = ACD + AC + CD$



(3.18) (a)

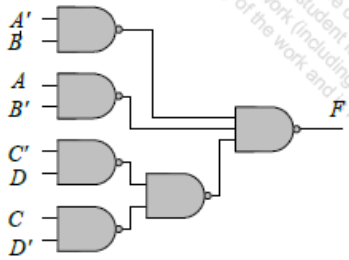
Total
6 points

F(A, B, C, D) = (A XOR B)'(C XOR D)
= (A'B + AB')' (C'D + CD')
= ((A'B + AB') + (C'D + CD'))'
=((A + B')' + (A' + B)') + ((C + D')' + (C' + D)') ' (nor gates)



(b)

F(A, B, C, D) = (A XOR B)'(C XOR D)
= (A'B + AB')' (C'D + CD')
= (A'B)' (AB')' ((C'D)' (CD')')' (nand gates)



Note: there are also other alternative solutions for 3.18.

3.20 Multi-level NOR:

Total
3 points

$F = ACD(B + C) + (BC' + DE')$
$F' = [ACD(B + C) + (BC' + DE')]'$
$F' = [(A' + C' + D')'(B + C) + (B' + C)' + (D' + E)']'$
$F' = [((A' + C' + D') + (B + C)')' + (B' + C)' + (D' + E)']'$
$F' = [(A' + C' + D' + (B + C)')' + (B' + C)' + (D' + E)']'$