ITI1100B&C

Professor: Qi Hao

Assignment # 3

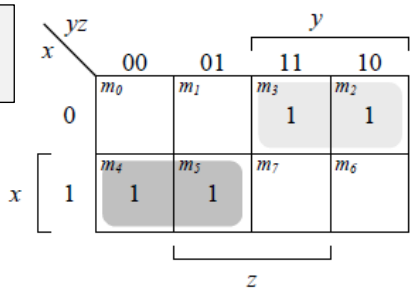
Submission Deadline Feb. 19, 2017 midnight (11h59 PM), BlackBoard Learn

From the textbook Chapter 3 pages 119-121, solve the following problems

3.2(c)(d)(e)(f), 3.4(c)(d)(e)(f), 3.5(c)(d), 3.6(a)(b), 3.8(c)(d), 3.10(c)(d)(f), 3.12(a), 3.13(c), 3.15, 3.16, 3.18.

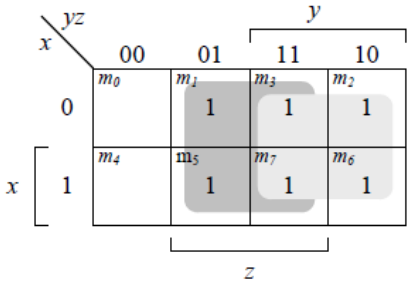
3.2

Total 4 points



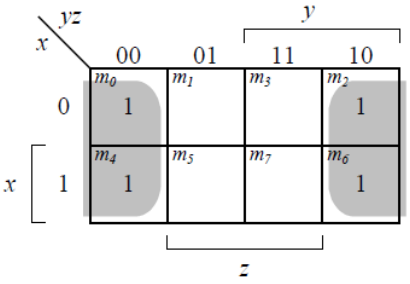
$F = xy' + x'y$

(c)



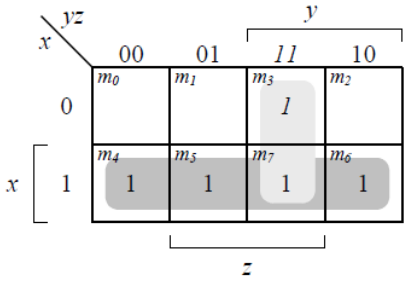
$F = y + z$

(d)



$F = z'$

(e)

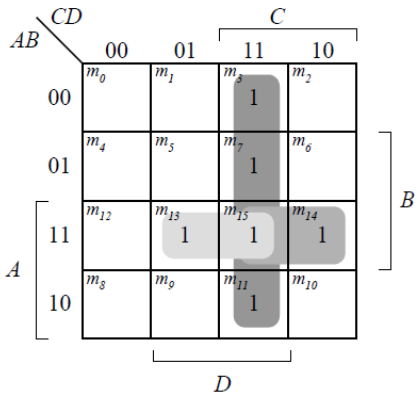


$F = x + y z$

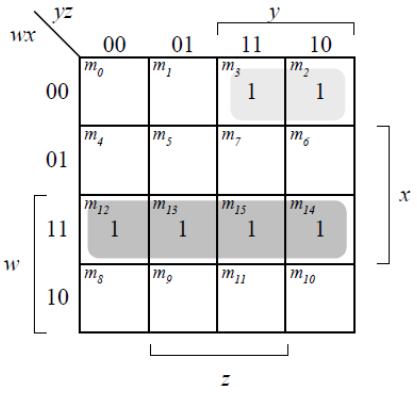
(f)

3.4

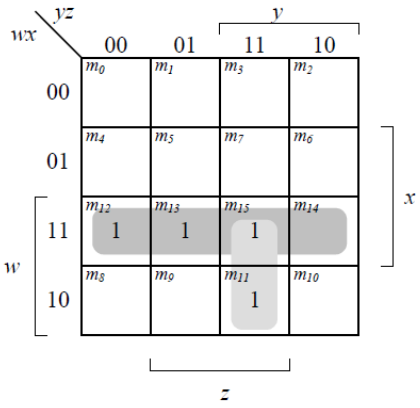
Total
4 points



(c) $F = CD + ABD + ABC$

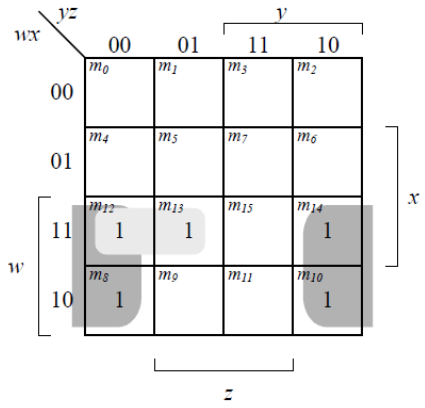


(d) $F = w'x'y + wx$



$F = wx + wyz$

(e)

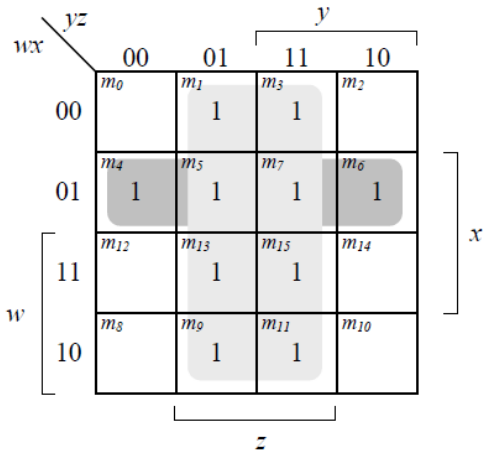


$F = wz' + xy'w$

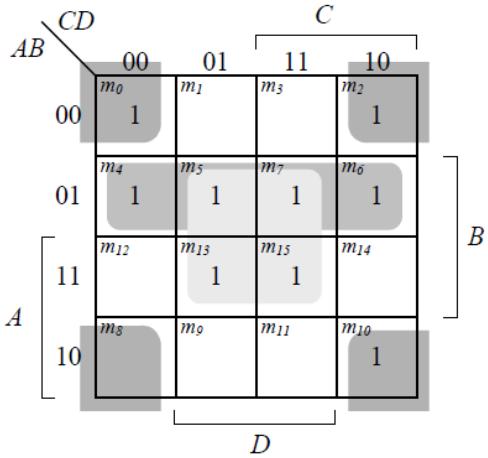
(f)

3.5

Total
2 points



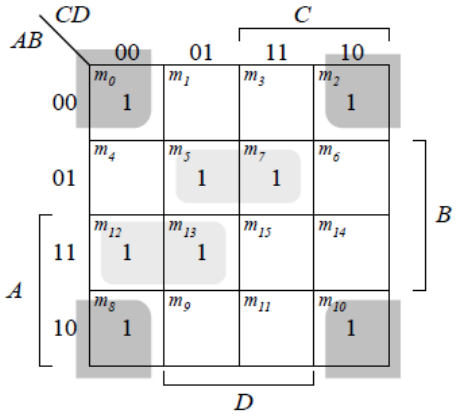
(c) $F = z + xw'$



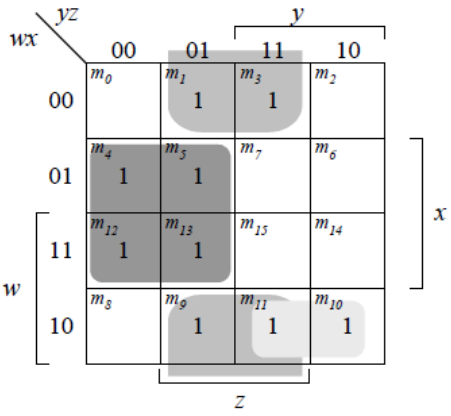
(d) $F = BD + A'B + B'D'$
$or = BD + B'D' + A'D'$

3.6

2 points



(a) $F = B'D' + A'BD + ABC'$

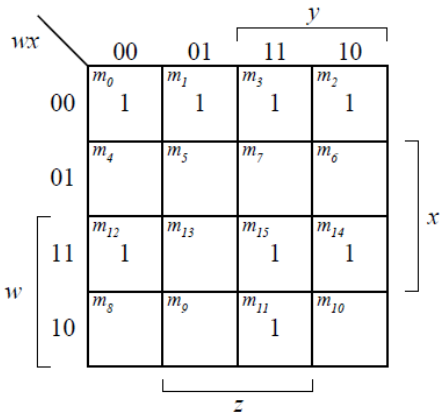


(b) $F = xy' + x'z + wx'y$

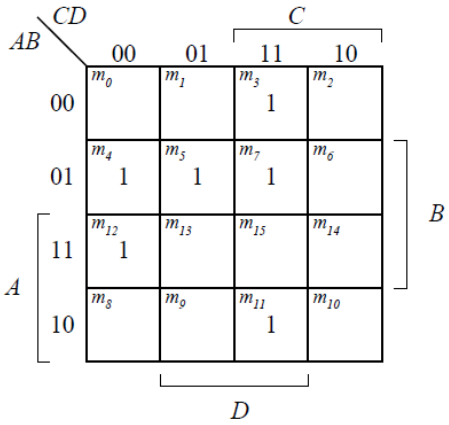
3.8

Total
2 points

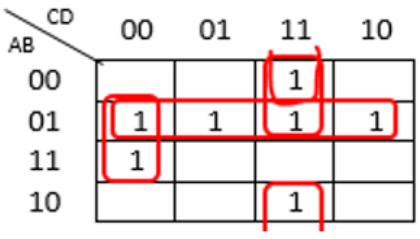
(c) $F = \Sigma(0, 1, 2, 3, 11, 12, 14, 15)$



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



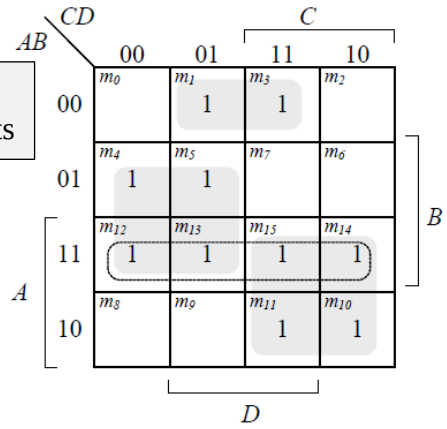
(d) Error. Correction:



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

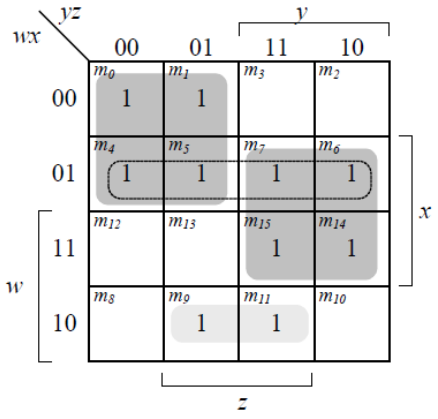
3.10

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)

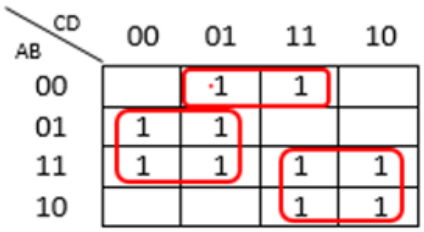


F = Σ(0, 1, 4, 5, 6, 7, 9, 11, 14, 15)
Essential: *w′y′, xy, wx′z*
Non-essential: *wx, x′y′z, w′wz, w′x′z*
F = *w′y′ + xy + wx′z*

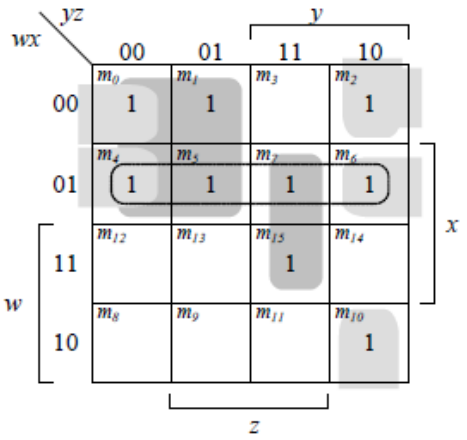
(d)

(c) has error. The correction is:

c)



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



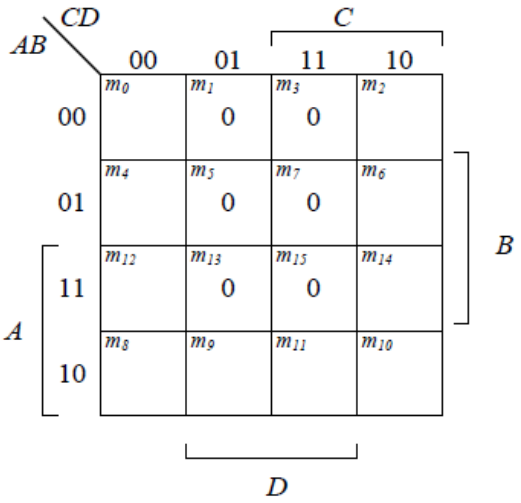
F = S(0, 1, 2, 4, 5, 6, 7, 10, 15)
Essential: *w'y', w'z', xyz, x'yz'*
Non-Essential: *w'x*
F = w'y' + w'z' + xyz + x'yz'

(f)

3.12 **(a)**

Total
2 points

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



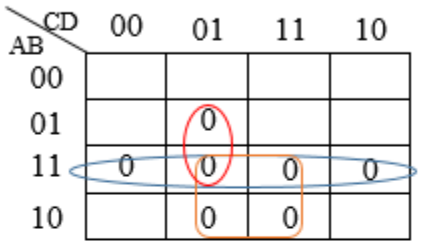
3.13 Total 3 points

c)

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

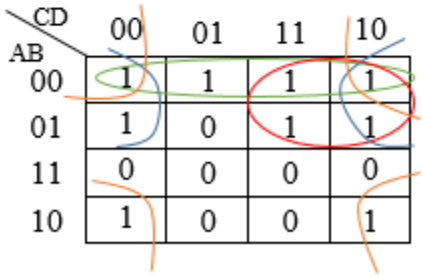
$$F = \left(A' + B + D'\right)\left(A' + B' + C'\right)\left(A' + B' + C\right)\left(B' + C + D'\right)$$

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



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

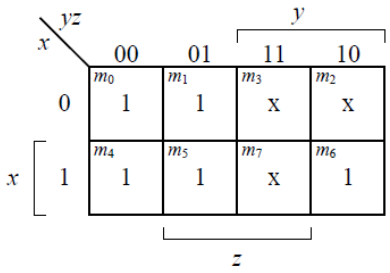
$$F = \left(A' + B'\right)\left(A' + D'\right)\left(B' + C + D'\right)$$



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

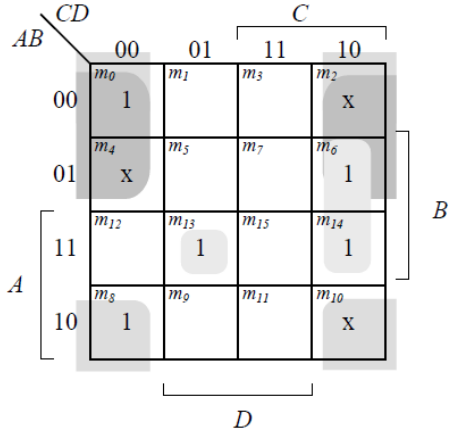
3.15

Total
6 points



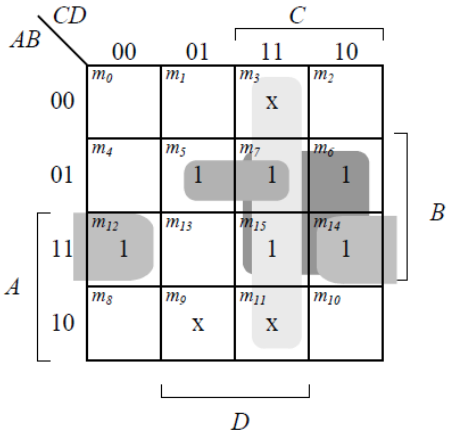
$F = 1$

$F = \Sigma(0,1,2,3,4,5,6,7)$



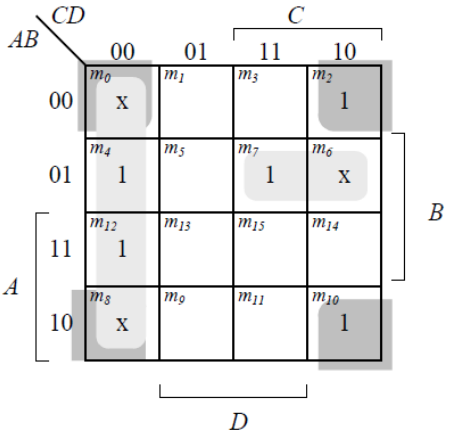
$F = A'D' + B'D' + BCD' + ABC'D$

$F = \Sigma(0, 2, 4, 6, 8, 10, 13, 14)$



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

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

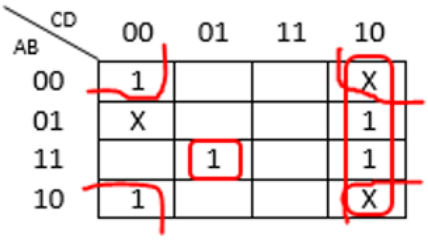


$F = B'D' + C'D' + A'BC$

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

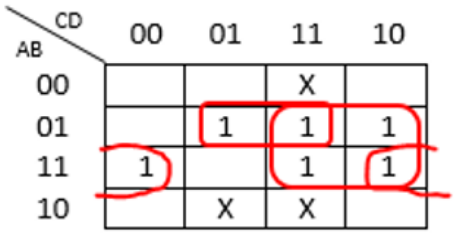
(b) and (c) have errors. Corrections are:

b)



$$\boldsymbol{F = B'D' + CD' + ABC'D = \sum(0, 2, 6, 8, 10, 13, 14)}$$

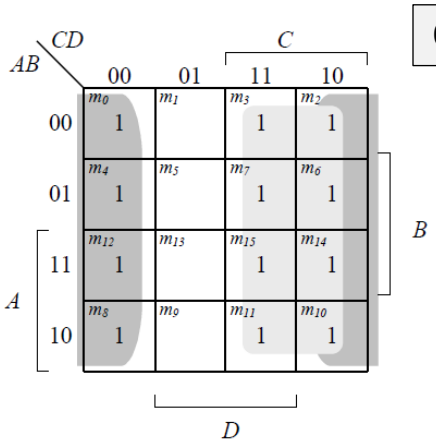
c)



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

3.16 **(a)**

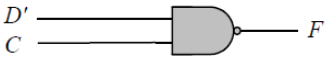
Total 6 points



0.5 points

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

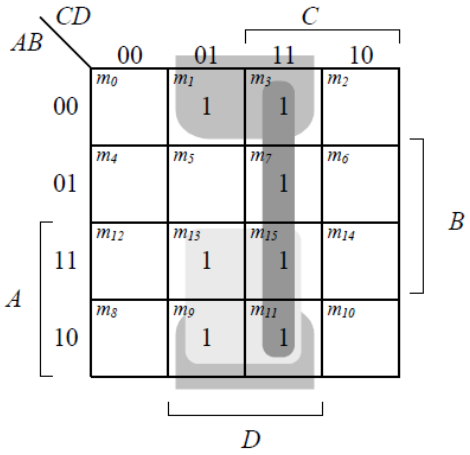
0.5 points



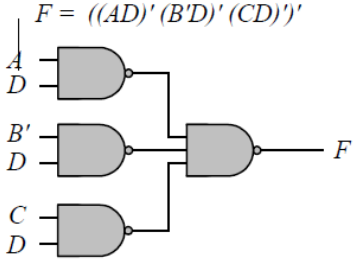
0.5 points

Note: error in (a). NAND inputs should be C' and D

(b)



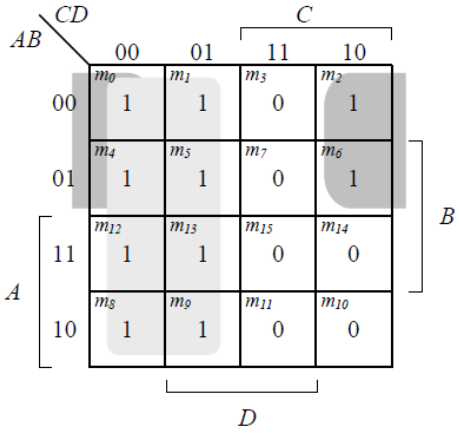
$F = AD + B'D + CD$
$F = ((AD)'(B'D)'(CD)')'$



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

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

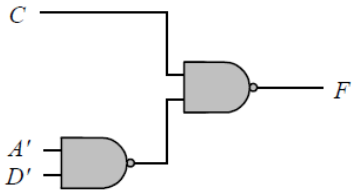
$F' = ACD + AC + CD$



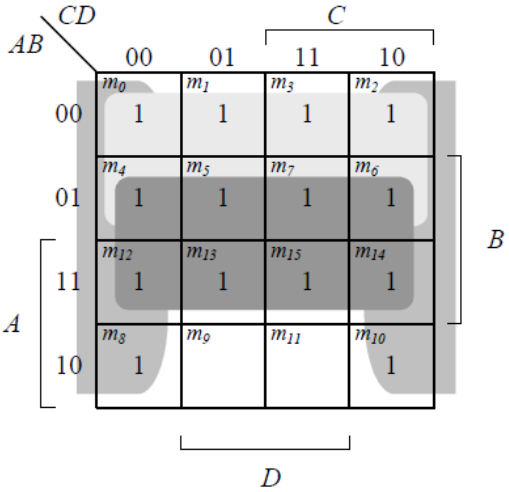
$F = C' + A'D'$

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

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

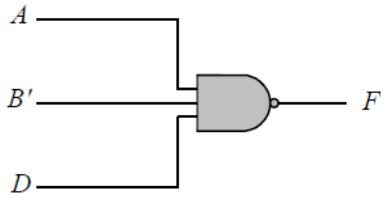


(d)

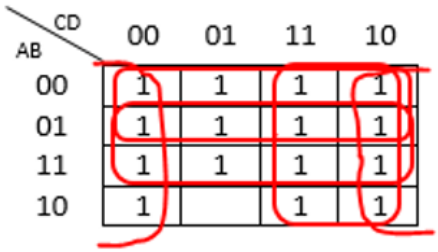


$F = A' + B + D'$

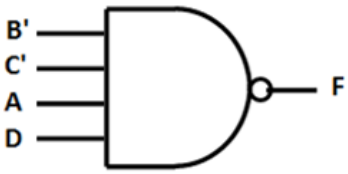
$F = (A(B')D)'$



d) Error. Correction:



$\boldsymbol{F = A' + B + D' + C}$



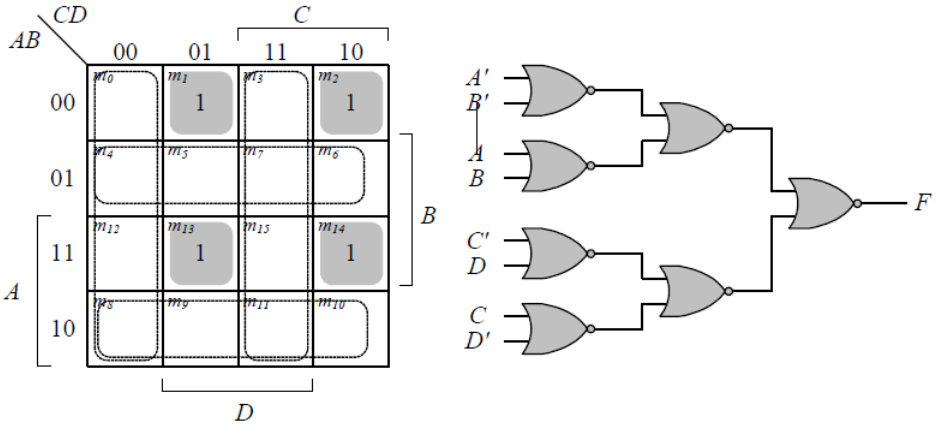
3.18 $F = (A \oplus B)'(C \oplus D) = (AB' + A'B)'(CD' + C'D)$

$= (AB + A'B')(CD' + C'D) = ABCD' + ABC'D + A'B'CD' + A'B'C'D$

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

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

Total
3 points



Note: there are also other alternative solutions for 3.18.