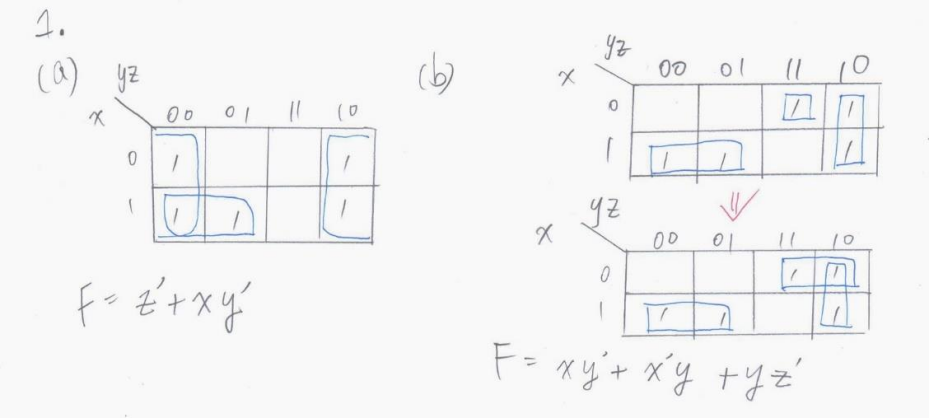
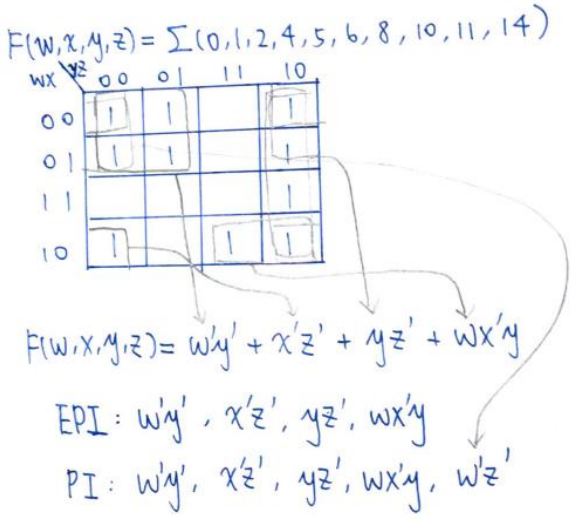
HW3

1. (10%) Simplify the following Boolean functions or expression, using three-variable maps:
   (a) $F(x, y, z) = \sum(0, 2, 4, 5, 6)$
   (b) $F(x, y, z) = xy' + x'yz + yz'$



(b) 將題目的 Boolean function 轉成 Sum-of-minterms:
$F = x'yz + x'yz' + xy'z' + xy'z + xyz'$

2. (20%) Simplify the following Boolean functions by first finding the essential prime implicants (Please indicate the essential prime implicants and prime implicants):
   (a) $F(w, x, y, z) = \sum(0, 1, 2, 4, 5, 6, 8, 10, 11, 14)$



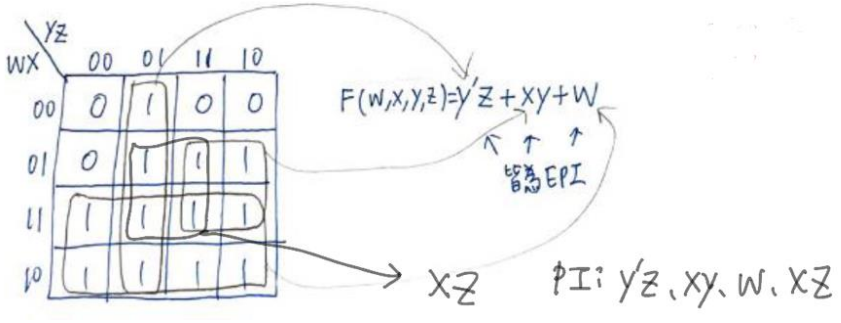
   (b) $F(w, x, y, z) = wz' + xy + y'z + wx'z$

2(b) $F(w,x,y,z) = wz' + xy + y'z + wx'z$

$= (wxyz' + wxy'z' + wx'yz' + wx'y'z') + (wxyz + wxyz' + w'xyz + w'xyz')$

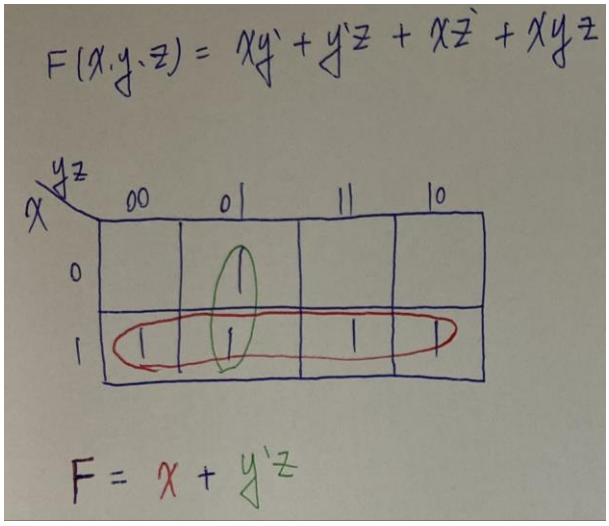
$+ (wxy'z + w'xy'z + w'x'y'z + wx'y'z) + (wx'yz + wx'y'z)$

$= \sum(1, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15)$

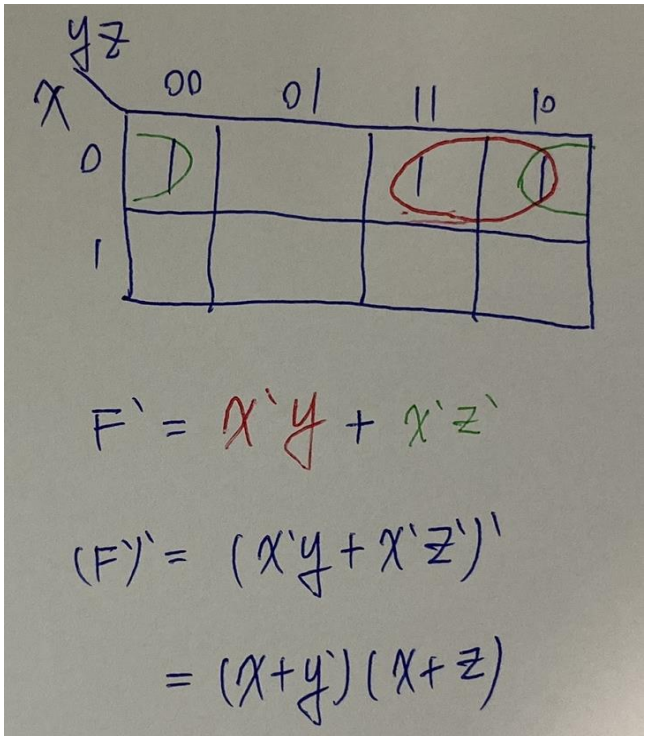


3. (10%) Simplify the following expressions in (a) sum of products and (b) product of sums:
$$F(x, y, z) = xy' + y'z + xz' + xzy$$

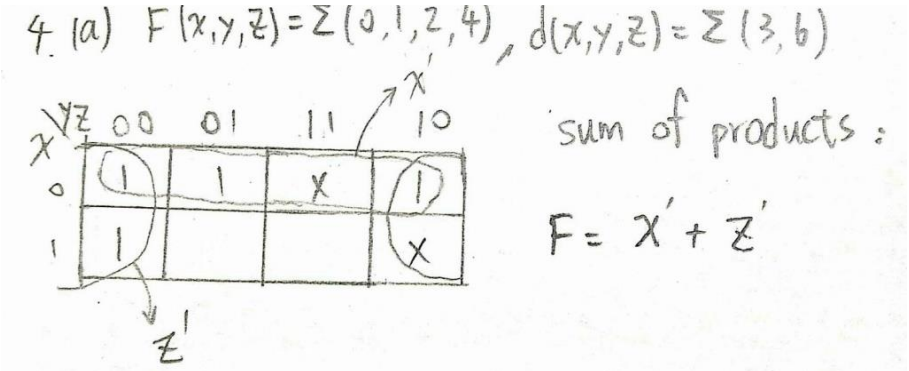
(a)



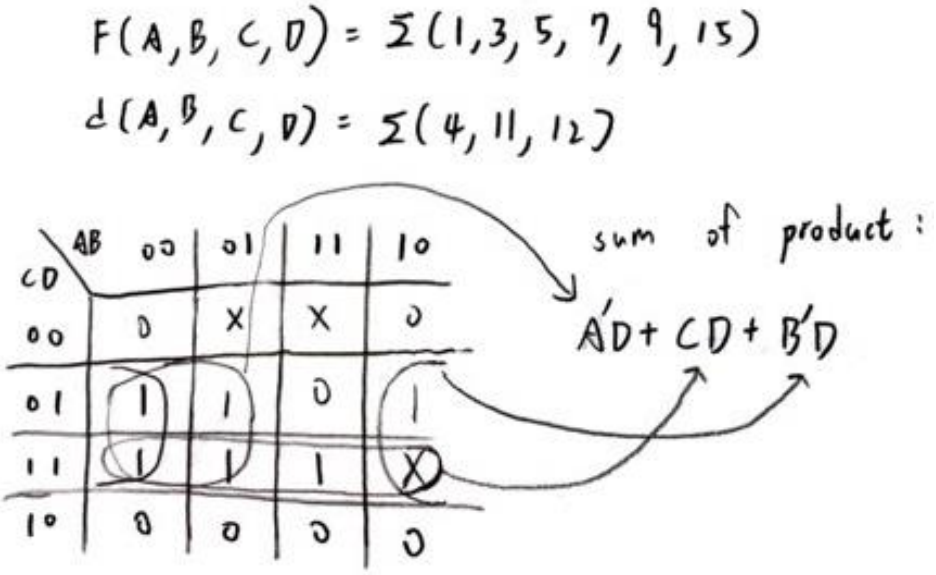
(b)



4. (20%) Simplify the following Boolean function F, together with the don't-care conditions d, and then express the simplified function in sum of products:
(a) $F(x, y, z) = \sum(0, 1, 2, 4), d(x, y, z) = \sum(3, 6)$

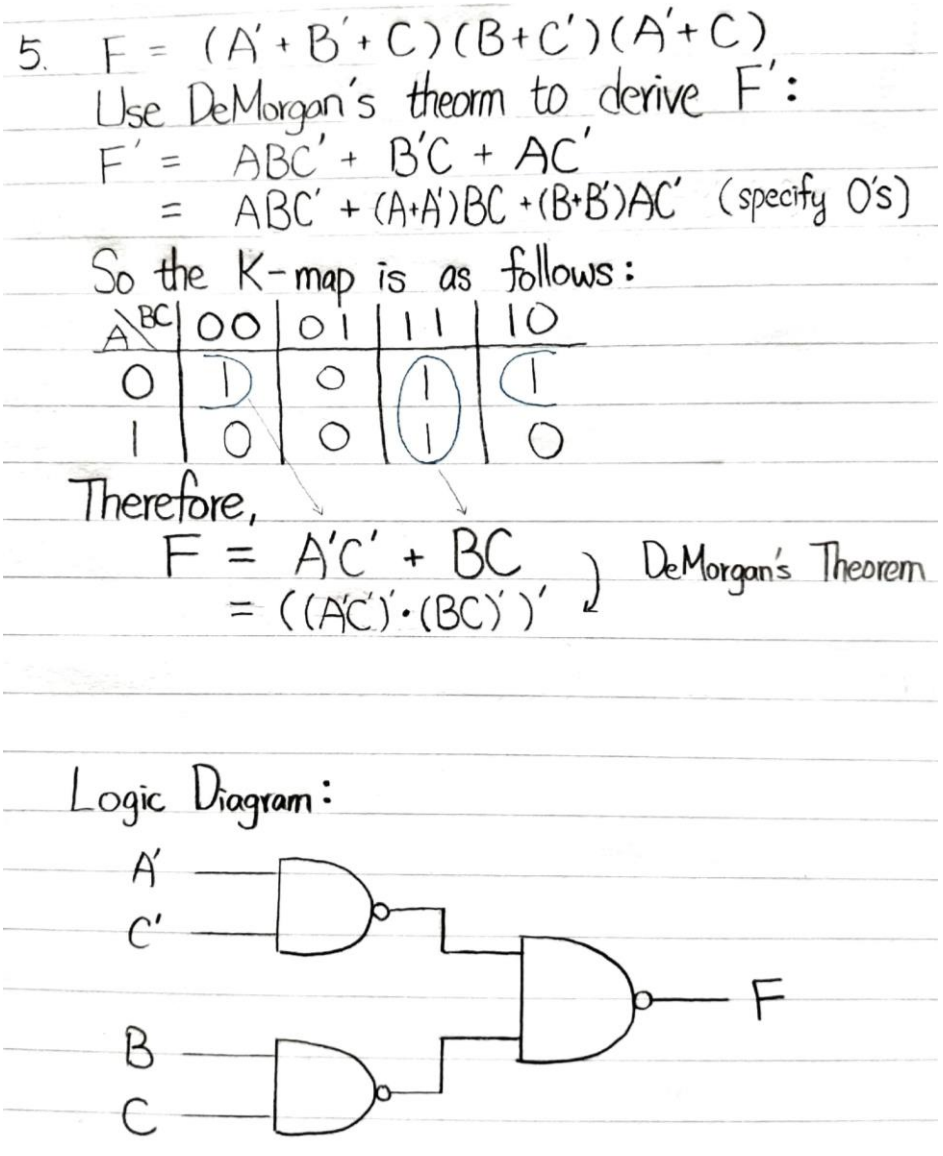


(b) $F(A,B,C,D) = \sum(1,3,5,7,9,15), d(A,B,C,D) = \sum(4,11,12)$



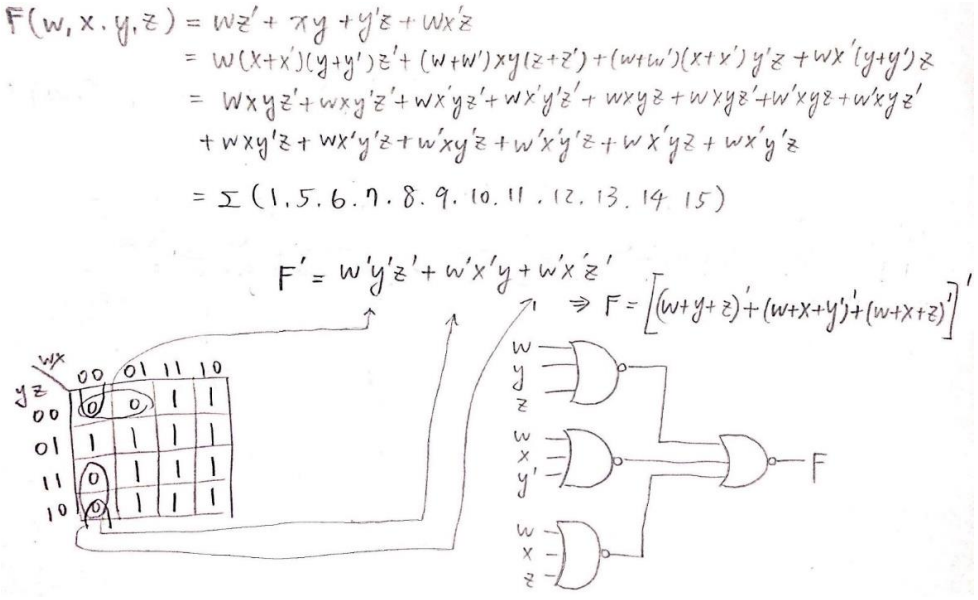
5. (10%) Simplify the following expression, and implement it with two-level NAND gates:

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



6. (10%) Simplify the following expression, and implement it with two-level NOR gates:

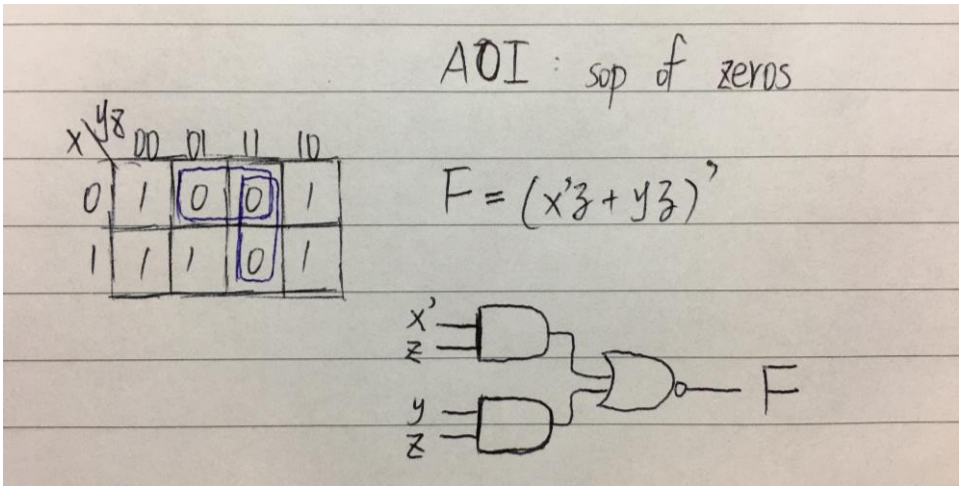
$$F(w,x,y,z) = wz' + xy + y'z + wx'z$$



7. (20%) Simplify the following Boolean function F, using the two-level forms (a) AND-OR-Inverter, (b) OR-AND-Inverter logic diagrams

$$F(x,y,z) = \sum(0,2,4,5,6)$$

(a)



(b)