Determine the PLA programming table needed to implement the following two boolean functions. Minimize the number of product terms. Show all your work, including the Karnaugh maps used in the minimization.

$$F_1(A,B,C,D) = \sum(1, 3, 4, 5, 7, 13, 15)$$
$$F_2(A,B,C,D) = \sum(0, 2, 3, 6, 7, 8, 10, 11, 12, 14)$$

Write your result in the following table.

Product terms	Inputs A B C D	Outputs ( ) ( ) F_1 F_2

Note: not all rows need to be used

F_1

$AB \backslash CD$	00	01	11	10
00		1	1	
01	1	1	1	
11		1	1	
10				

F_2

$AB \backslash CD$	00	01	11	10
00	1	0	1	1
01	0	0	1	1
11	1	0	0	1
10	1	0	1	1

$F_1 = A'D + BD + A'BC'$ ①

$= A'D + A'BC' + ABD$ ②

$= (CD' + AB' + BD' + AD')'$ ③

④ $F_2 = A'C + B'D' + AD' + B'C$

⑤ $= (C'D + A'BC' + ABD)'$

using

① & ④ → no common terms; 3 + 4 = 7 terms

② & ④ → 7 terms

③ & ④ → $B'D'$, AD' are common; 4 + 4 − 2 = 6 terms

① & ⑤ → $A'BC'$ is common; 3 + 3 − 1 = 5 terms

② & ⑤ → $A'BC'$ & ABD are common; 3 + 3 − 2 = 4 terms

③ & ⑤ → no common terms; 4 + 3 = 7 terms

∴ select ② & ⑤

Product terms	A	B	C	D	(T) F_1	(C) F_2
$A'D$	0	–	–	1	1	–
$A'BC'$	0	1	0	–	1	1
ABD	1	1	–	1	1	1
$C'D$	–	–	0	1	–	1