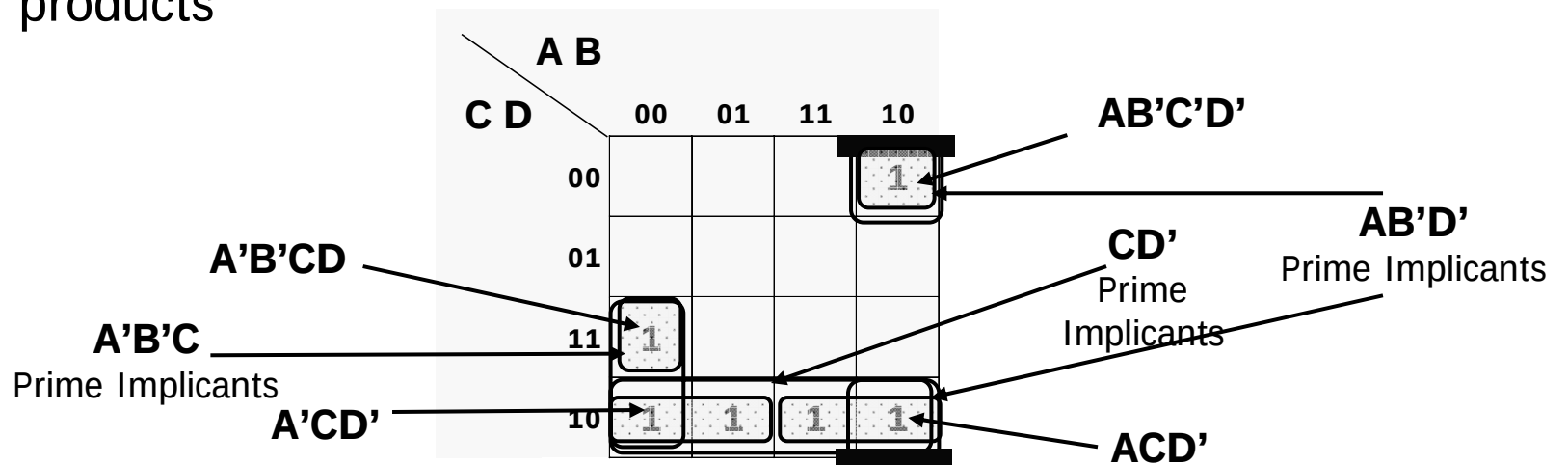


Prime Implicants

- A group of 1's which are adjacent and can be combined on a Karnaugh Map is called an implicant.
- If it can not be combined with another term to eliminate a variable, it is called a prime implicant.
- A minimum sum of products will contain only prime implicants.
- Not all prime implicants are needed in a minimum sum of products

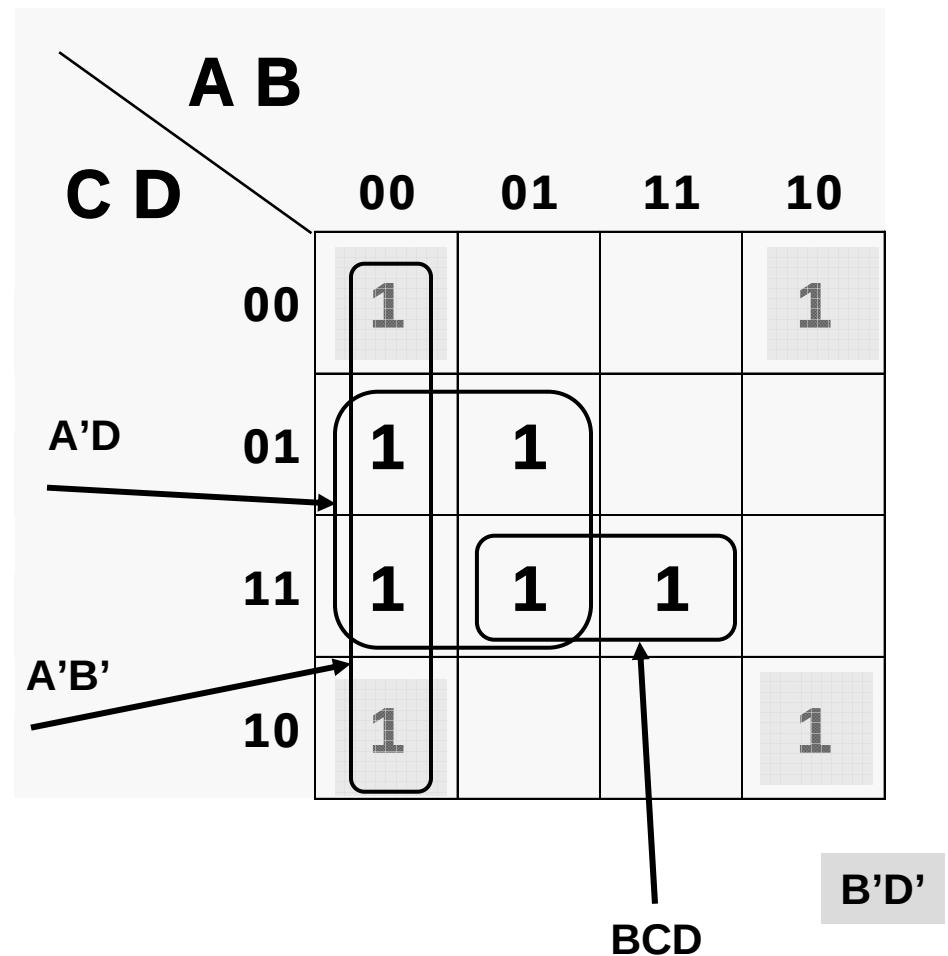


Prime Implicants

This function has exactly 4 prime implicants

Only 3 are needed in the minimum sum of products

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

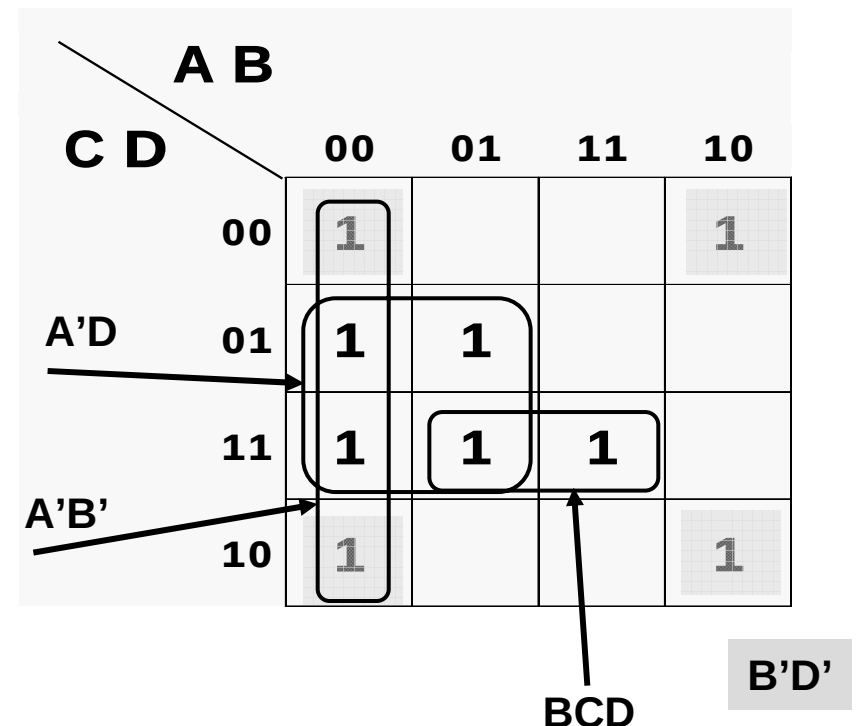


Essential Prime Implicants

- An essential prime implicant is one which covers a minterm NOT covered by any other prime implicant.
- All essential prime implicants are part of the minimum sum of products.

$A'D$ is an essential prime implicant since it is the only one which covers **$A'BC'D$**

$A'B'$ is not an essential prime implicant since the minterms it covers are covered by other prime implicants



Finding the Minimum Sum of Products

1. Find each essential prime implicant and include it in the solution.
2. Determine if any minterms are not yet covered.
3. Pick a prime implicant which covers it.
4. Continue until all minterm are covered.
5. Return to step 3 and check other combinations of (non-essential) prime implicants to find the minimum set.

Find the Minimum Sum of Products

1. Find all the prime implicants

		A B			
		00	01	11	10
C D	00	1	1		
	01			1	1
	11	1	1	1	1
	10	1	1		

2. Find all the essential prime implicants

$$F = AD + A'D' + \dots$$

		A B			
		00	01	11	10
C D	00	1	1		
	01			1	1
	11	1	1	1	1
	10	1	1		

3. Select a set of non-essential prime implicants which covers all minterms

$$F = AD + A'D' + CD$$

OR

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

		A B			
		00	01	11	10
C D	00	1	1		
	01			1	1
	11	1	1	1	1
	10	1	1		