

K-Maps with Don't Care Condition

$$\textcircled{E} \quad f(A, B, C, D) = \sum m(0, 1, 2, 4, 6, 8, 10) + d(5, 7, 14)$$

Ex $f(A,B,C,D) = \sum m(0,1,2,4,6,8,10) + d(5,7,14)$

\downarrow essential
 \downarrow optional
 \downarrow fill by 1
 \downarrow fill by X

	$\overline{C}\overline{D}$ 00	$\overline{C}D$ 01	CD 11	$C\overline{D}$ 10	
$\overline{A}\overline{B}$ 00	1 0	1 1		1 2	
$\overline{A}B$ 01	1 4	X 5	X 7	1 6	
AB 11				X 14	
$A\overline{B}$ 10	1 8			1 10	

Annotations:

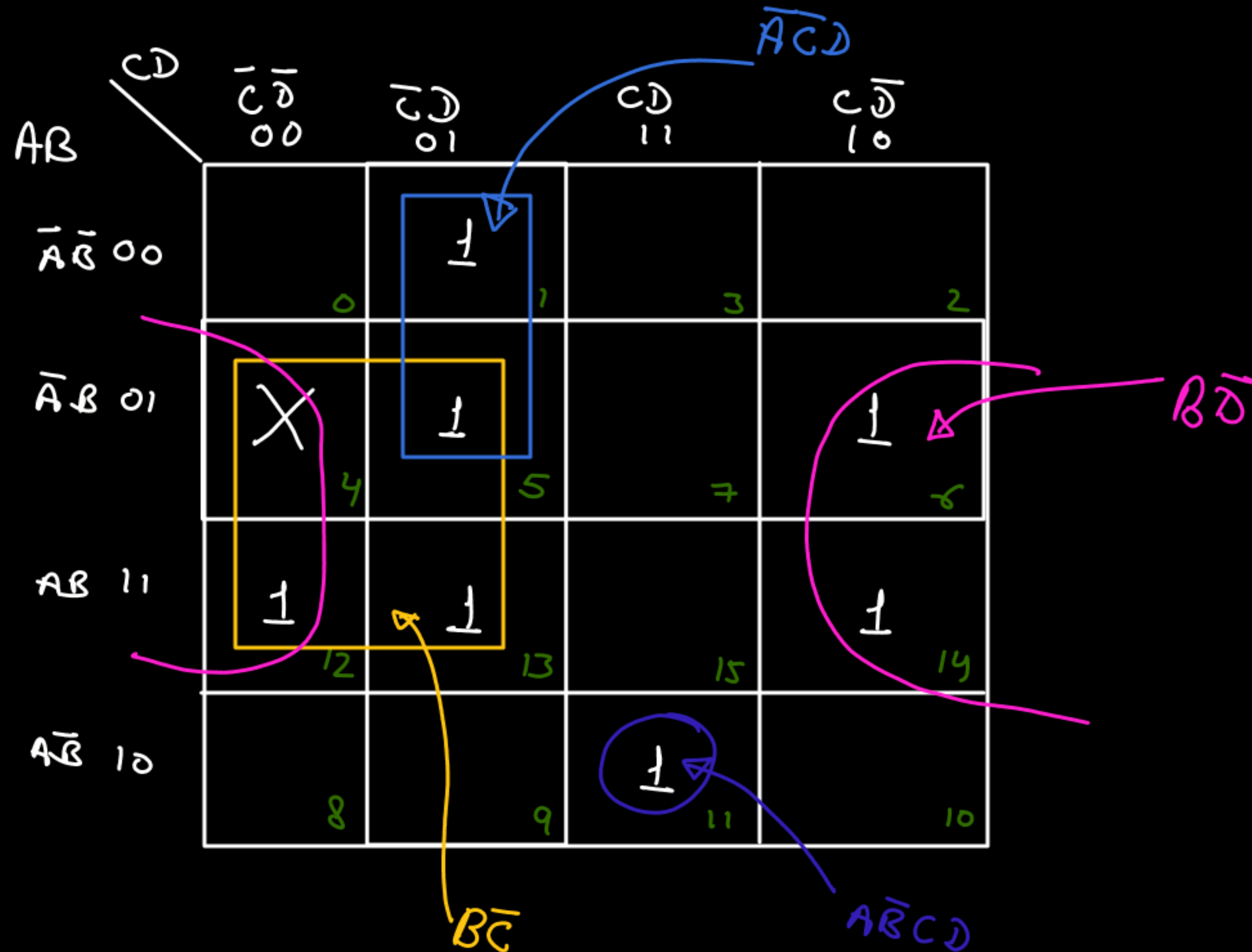
- Yellow box around cells (0,0), (0,1), (1,0), (1,1) labeled $\overline{A}\overline{C}$.
- Green box around cells (0,1), (1,1), (1,0), (1,1) labeled $C\overline{D}$.
- Blue box around cells (0,0), (1,0), (1,1), (0,1) labeled $\overline{B}\overline{D}$.
- Blue arrow pointing to cell (1,1) labeled "Ignore".

$$f = \overline{A}\overline{C} + C\overline{D} + \overline{B}\overline{D}$$

*tip \rightarrow Minimal grouping
with Don't Care
Condition

Q Minimize the following function in SOP form.

$$f = \sum m(1, 5, 6, 11, 12, 13, 14) + d(4)$$



$$f = \bar{A}\bar{C}D + B\bar{C} + B\bar{D} + A\bar{B}CD$$

K-Maps (Most important Terminologies)

1) Implicant : It is nothing but a minterm or maxterm

2) Prime Implicant: It is formed by grouping the maximum possible adjacent cells.

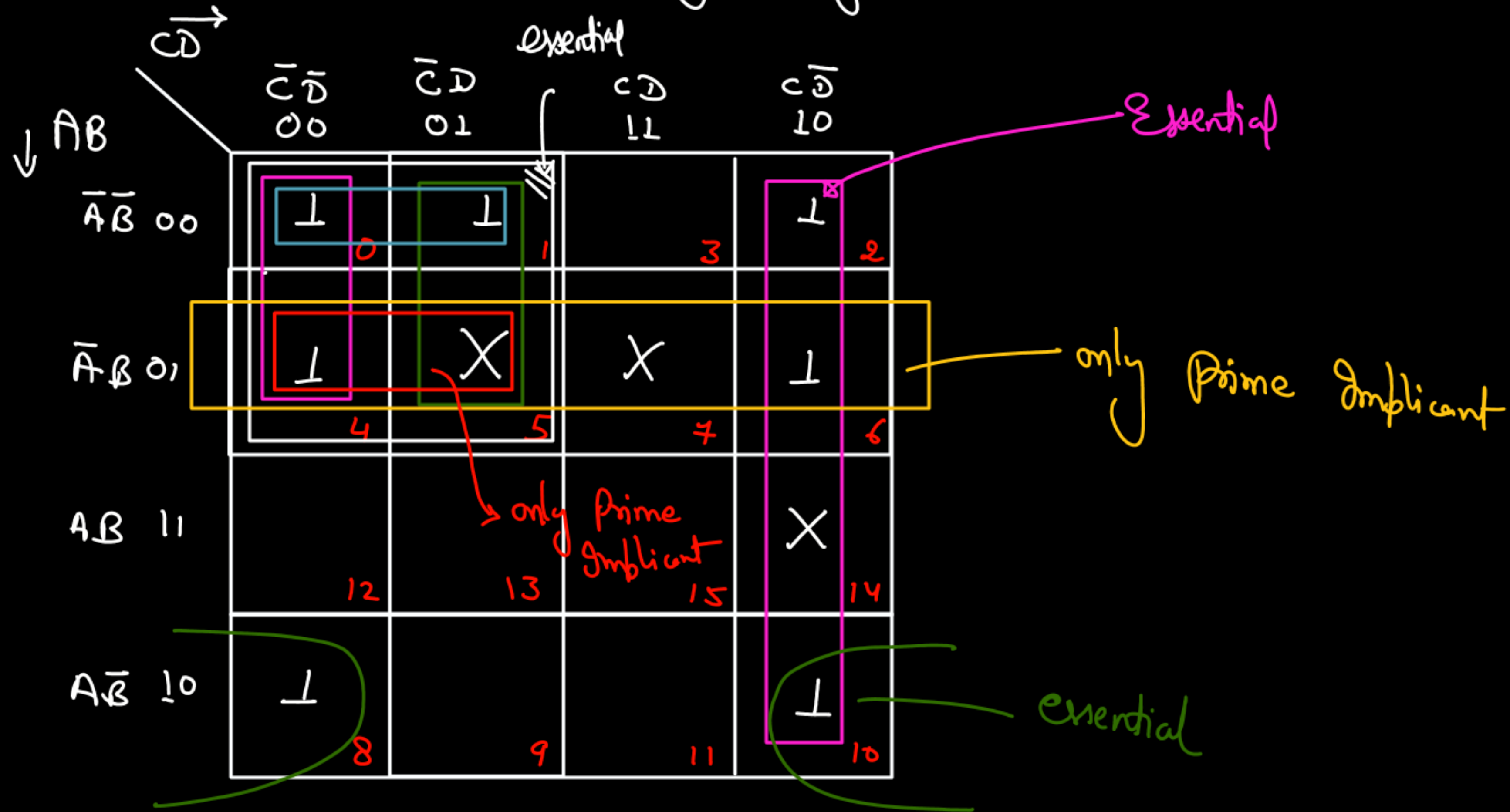
Karnaugh map for the function $F(A, B, C, D) = A + B + C + D$. The map shows 1s in cells 1, 3, 4, 5, 7, 11, 13, 14, and 15. A red box highlights the 1s in cells 1 and 3. Blue boxes highlight the 1s in cells 4 and 5, 7 and 15, 11 and 13, and 14. A red arrow points to cell 4.

all
are
Prime
Implicit

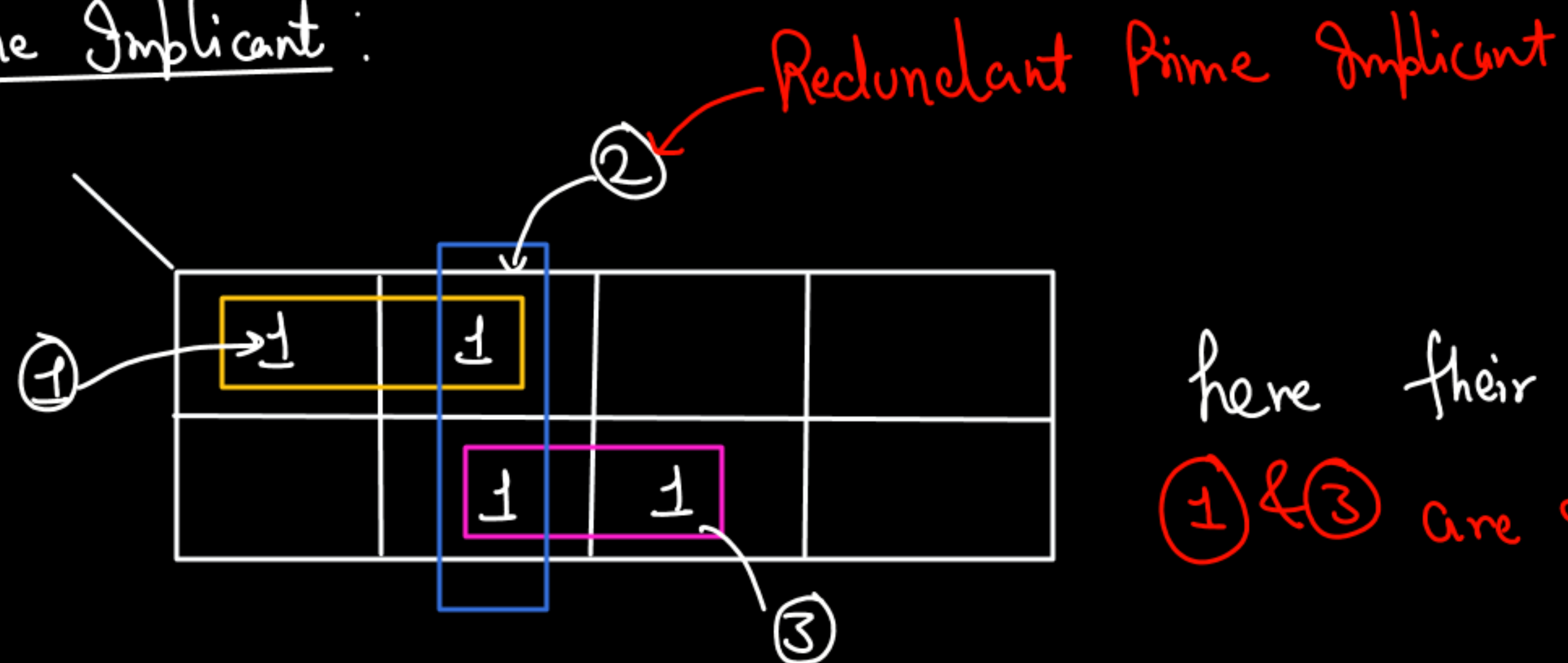
Implications

3) Essential Prime Implicant :

It is a prime implicant which consist atleast one minterm.
 & It is not covered by any other prime implicant.

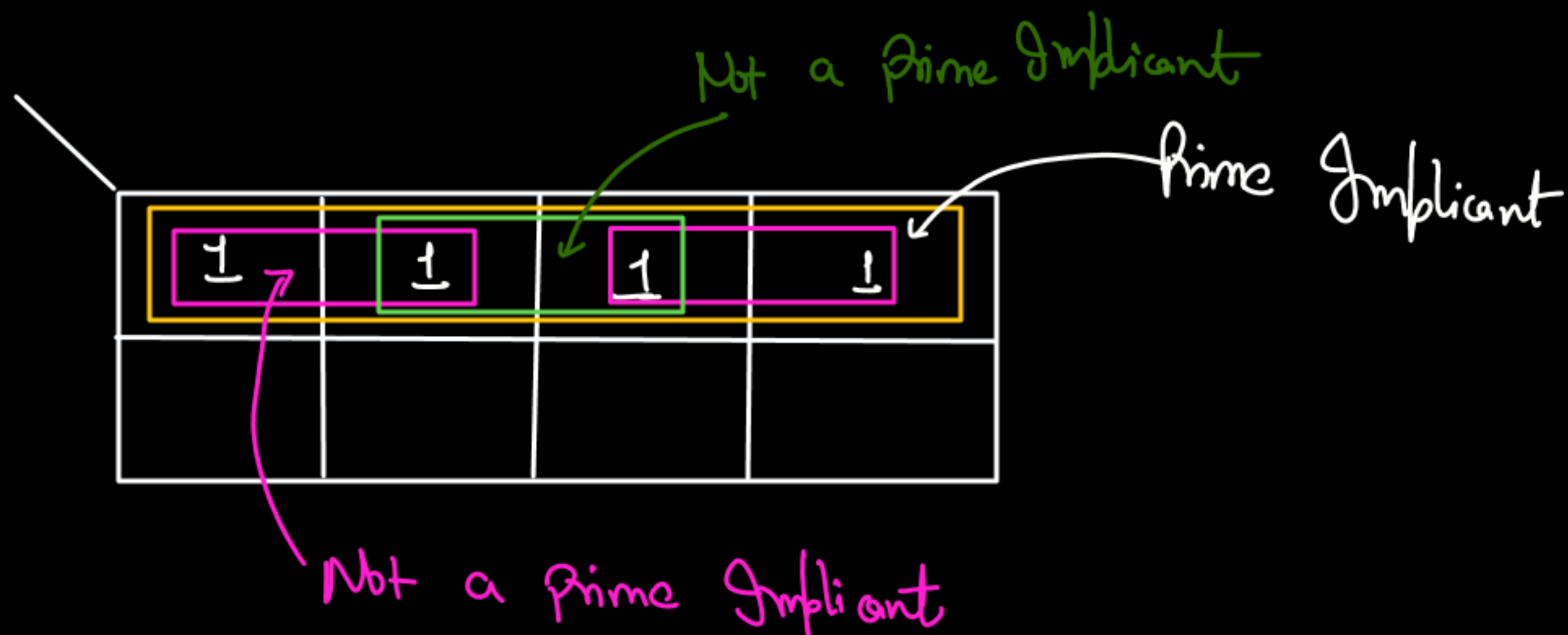


Prime Implicant:



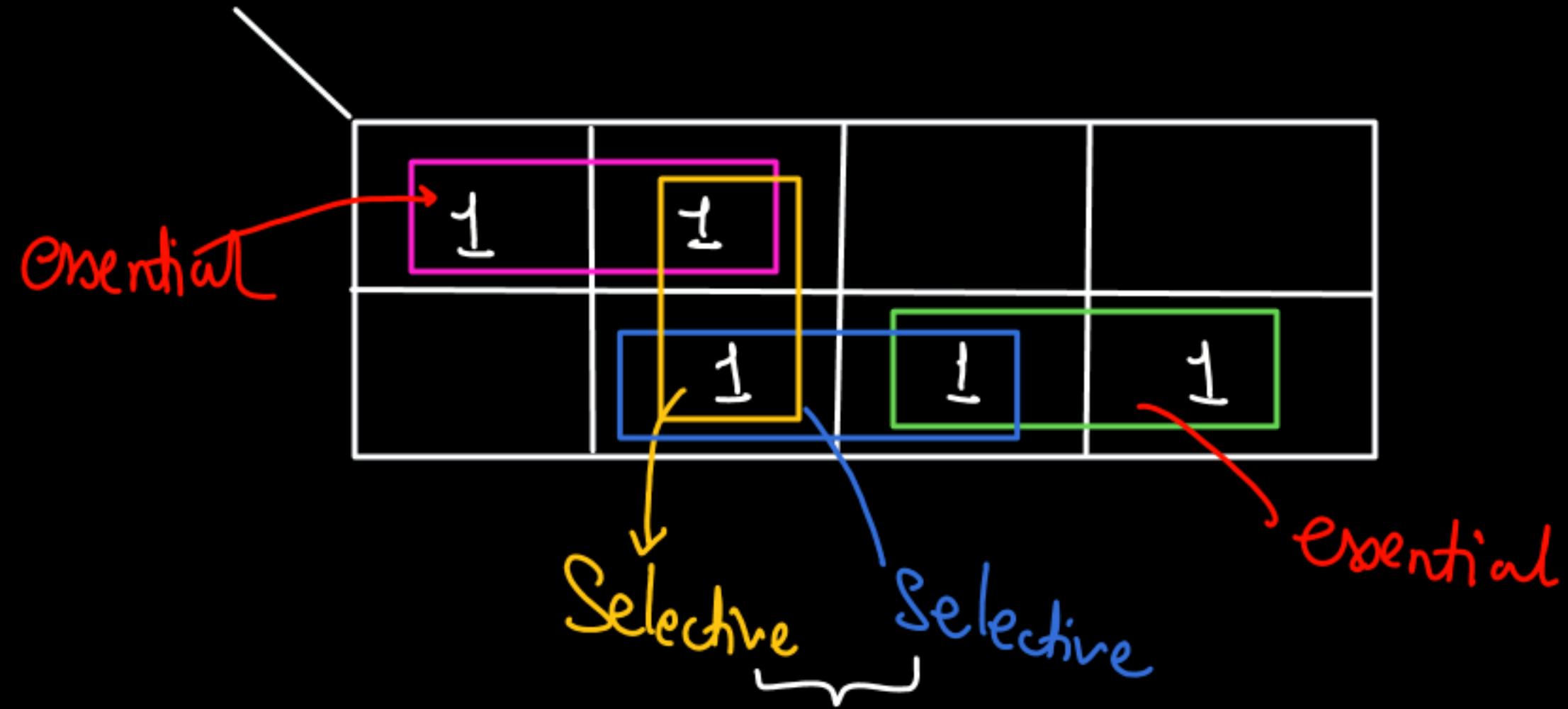
here there are 3 prime implicants
① & ③ are Essential prime implicants

* form as large group as possible from all the combinations.



Important
↓
* Do Not form a smaller group within a large group
↓
→ Do NOT form a quad inside an octate
→ Do NOT form a pair inside a quad.

Selective Prime Implicant:



Any group can be used, hence both are selective prime implicant

No. of Selective Prime Implicants = 2

Q3

	1	1	1	
	1	1	1	

Diagram illustrating a Karnaugh map with groupings:

- Group 1 (Red box): A 2x2 square of 1s in the top-left quadrant, labeled with a circled 1.
- Group 2 (Yellow box): A 2x2 square of 1s in the bottom-left quadrant, labeled with a circled 2.

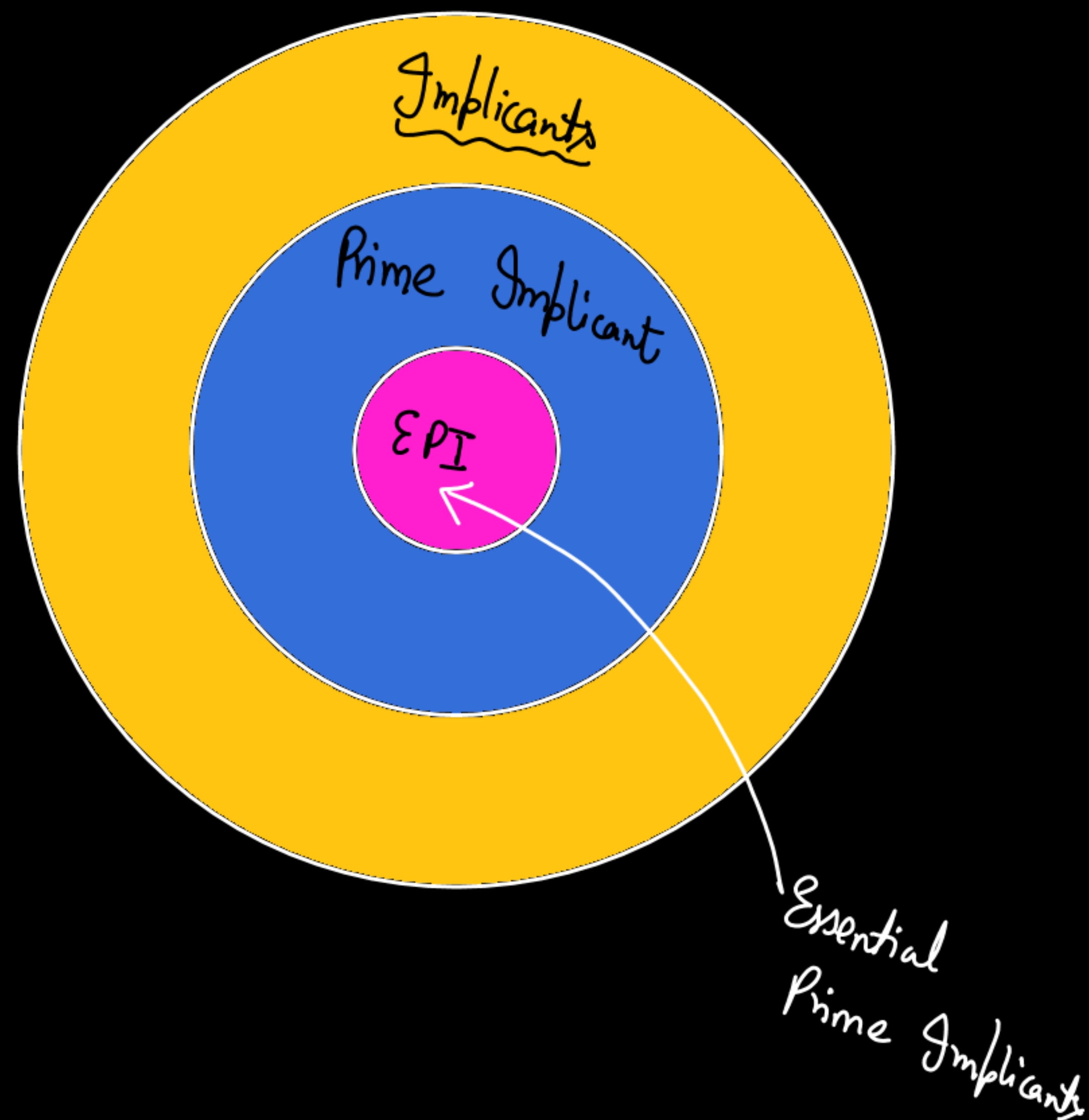
Prime Implicants = 2

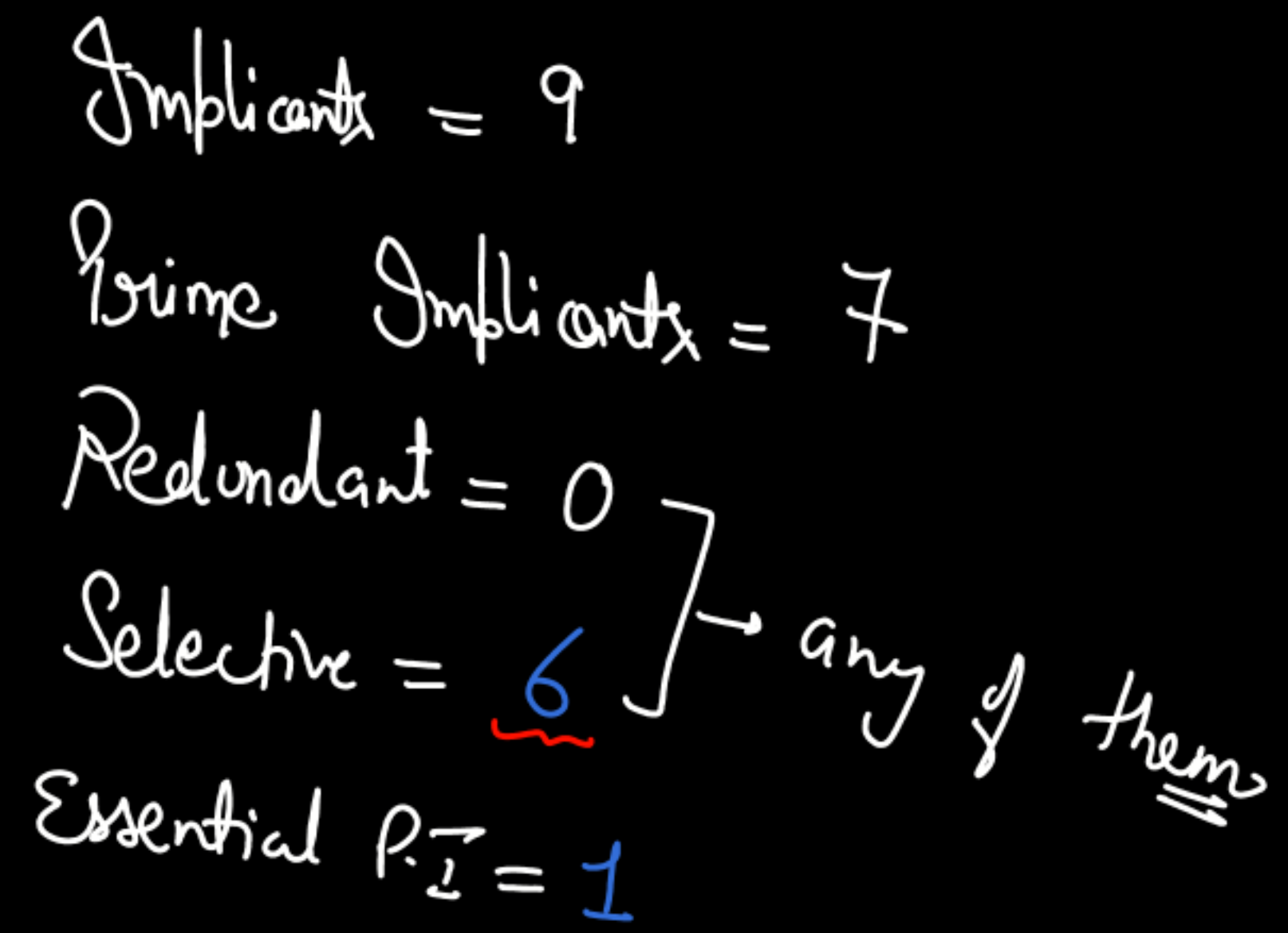
Implicant = 6

Essential P.I. = 2

Redundant P.I. = 0

Selective P.I. = 0





Prime Implicants = 7

Redundant = 0

Selective = 6 → any of them

Essential $P_{\vec{I}} = 1$

① → Essential

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↳ Combinational Circuits (Comp) & Arithmetic

↓
COA