DATE

$f(x_1, x_2, x_3, x_4, x_5) = \sum(0, 1, 2, 8, 9, 15, 17, 21, 24, 25, 31)$

Step 1

minterms Binary representation

0 → 00000
1 → 00001
2 → 00010
8 → 01000
9 → 01001
17 → 10001
24 → 11000
21 → 10101
25 → 11001
15 → 01111
27 → 11011
31 → 11111

Step 2 : Table 1

Groups	minterms	Binary representation	
0	0	✓ 00000	→ no 1's
1	1	✓ 00001	only one 1's
	2	✓ 00010	
	8	✓ 01000	
2	9	✓ 01001	Two 1's
	17	✓ 10001	
	24	✓ 11000	
3	21	✓ 10101	Three 1's
	25	✓ 11001	
4	15	✓ 01111	Four 1's
	27	✓ 11011	
5	31	✓ 11111	Five 1's

Step 3 : Table 2

Groups	matched pairs	Binary Rep.			
0	0,1	0000- ✓	3	25, 27	110-1 F
	0,2	00-0 H			
	0,8	0-000 ✓		15, 31	-111 E
1	1,9	0-001 ✓	4	27, 31	11-11 D
	1,17	-0001 ✓			
	2,9	0100- ✓			
	8,24	-1000 ✓			
	9,25	-1001 ✓			
2	17,25	1-001 ✓			
	24,25	1100- ✓			

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Step 4 : Table 3.

Groups	matched pairs	Binary Representation	
0	(0,1,8,9)	0_00_	C
	(0,8,1,9)	0-00_	
1	(1,9,17,25)	--001	B
	(1,17,9,25)	--001	
	(8,9,24,25)	-100_	A
	(8,24,9,25)	_100_	

Step 5 : Prime - Implicant Table

	P.I	Associated minterms	0	1	2	8	9	15	17	21	24	25	27	31
X	A	(8,9,24,25)				X	X				X	X		
	B	(1,9,17,25)		X			X		X			X		
	C	(0,1,8,9)	X	X		X	X							
	D	(27,31)											X	X
X	E	(15,31)						X						X
	F	(25,27)										X	X	
X	G	(17,21)							X	X				
X	H	(0,2)	X		X									
			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

(0,1,25)

Unticked Columns.

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Step 5:

		0	1	27
B	(1,9,17,25)	✱	X	✱
C	(0,1,8,9)	X	X	
D	(27,31)			✱
F	(25,27)			X

$\left.\begin{matrix} \\ \\ \\ \end{matrix}\right\}$ A + B + E + F + G + H.

Step 6: Prime Implicant Reduced Prime Implicant Table

Step 5: Prime Implicant Table.

P.I	Associated minterms	0	1	2	8	9	15	17	21	24	25	27	31
✱ A	(8,9,24,25)				X	X				X	X		
B	(1,9,17,25)		X			X		X			X		
C	(0,1,8,9)	X	X		X	X							
D	(27,31)											X	X
✱ E	(15,31)						X						X
F	(25,27)										X	X	
✱ G	(17,31)							X	X				
✱ H	(0,2)	X	X	X									
X													

Step 6: Reduced Prime Implicant Table.

P.I	Associated minterms	1	27
✱ B	(1,9,17,25)	✱	
C	(0,1,8,9)	✱	
D	(27,31)		✱
✱ F	(25,27)		✱

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