DELD

21118

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A) $f(A,B,C,D) = \Sigma m(1,2,3,4,9) + d(10,11,12)$

→

Given: $f(A,B,C,D) = \Sigma m(1,2,3,4,9) + d(10,11,12)$

Solution: The k-map for the given function is 4-variable & it will be represented as

AB \ CD	00	01	11	10
00	0	1	1	1
01	1	0	0	0
11	X	0	0	0
10	0	1	X	X

X → don't care.

$y = B\bar{C}\bar{D} + \bar{B}D + \bar{B}C$

I II III

$= B\bar{C}\bar{D} + \bar{B}(C+D)$

$= B(\overline{C+D}) + \bar{B}(C+D)$ .. by de-morgan's law.

$= B \oplus (C+D)$

∴ Ans.

B) $f(A,B,C,D) = \Sigma m(0,1,2,3,5,7,8,9,11,14)$

→

Solution: The k-map for the given function is 4-variable k-map. & it will be represented as

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

$y = \bar{A}\bar{B} + \bar{A}D + \bar{B}\bar{C} + \bar{B}D + ABC\bar{D}$

$y = \bar{A}(\bar{B}+D) + \bar{B}(\bar{C}+D) + ABC\bar{D}$

Ans

2)

A)

→ Given: BCD Adder using IC7483.

& to find: Operations to verify

a) 2+3

b) 7+8

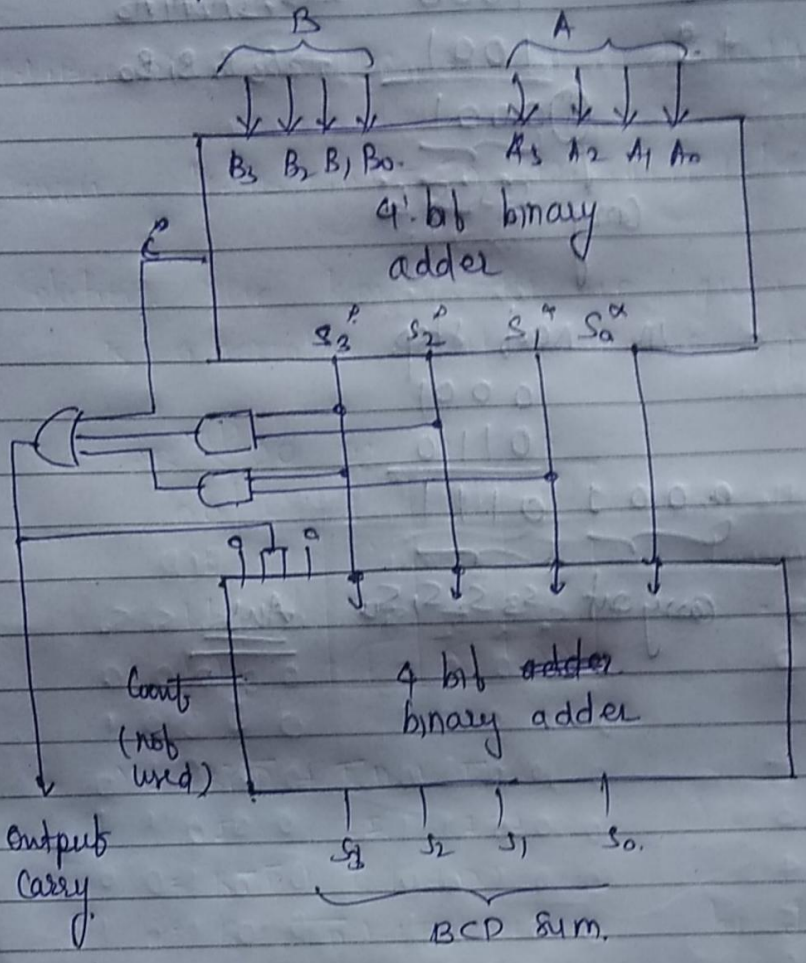
c) 8+9.

Solution:

Truth table:

Decimal:	Binary (intermediate values)					BCD				
	C	S_4	S_3	S_2	S_1	C	S_3	S_2	S_1	S_0
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	1
2	0	0	0	1	0	0	0	0	1	0
3	0	0	0	1	1	0	0	0	1	1
4	0	0	1	0	0	0	0	1	0	0
5	0	0	1	0	1	0	0	1	0	1
6	0	0	1	1	0	0	0	1	1	0
7	0	0	1	1	1	0	0	1	1	1
8	0	1	0	0	0	0	1	0	0	0
9	0	1	0	0	1	0	1	0	0	1
10	0	1	0	1	0	1	0	0	0	0
11	0	1	0	1	1	1	0	0	0	1
12	0	1	1	0	0	1	0	0	1	0
13	0	1	1	0	1	1	0	0	1	1
14	0	1	1	1	0	1	0	1	0	0
15	0	1	1	1	1	1	0	1	0	1
16	1	0	0	0	0	1	0	1	1	0
17	1	0	0	0	1	1	0	1	1	1
18	1	0	0	1	0	1	1	0	0	0

circuit diagram:



1) for BCD addition two 4-bit binary adders are used.
2) the output of first adder is given to the 1st input of 2nd adder & 2nd input of 2nd adder is based on the truth table which is $C' + S_3S_2 + S_3S_1$

operations

a) 2+3 =>

		binary form		
	2	0010	→ $A_3A_2A_1A_0$	
+	3	0011	→ $B_3B_2B_1B_0$	(No carry)
		0101	→ $S_3S_2S_1S_0$	

b) 7+8 =>

		binary form.		
	7	0111	→ $A_3A_2A_1A_0$	(No carry)
+	8	1000	→ $B_3B_2B_1B_0$	

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⇒ 8+9

8	1000	$\rightarrow A_3 A_2 A_1 A_0$
+9	1001	$\rightarrow B_3 B_2 B_1 B_0$
	①0001	

carry $S_3' S_2' S_1' S_0'$

In next step

0001
0110
0001 0111

carry out $S_3 S_2 S_1 S_0$ Ans

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Q2

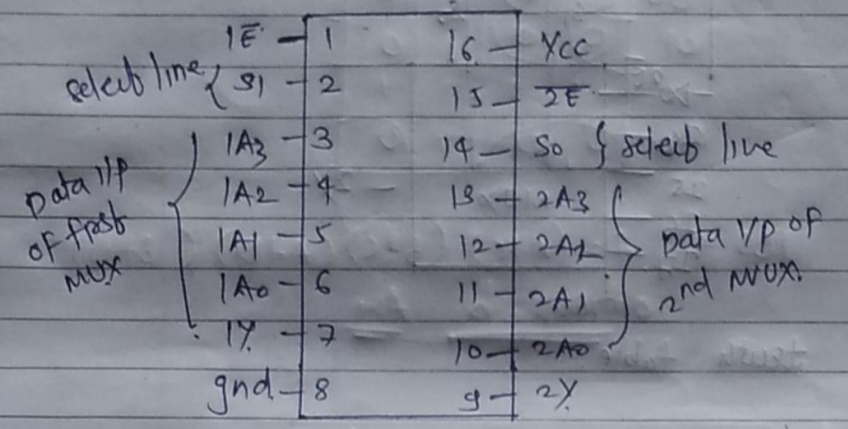
B)

→ To design: full Adder using IC 74153.

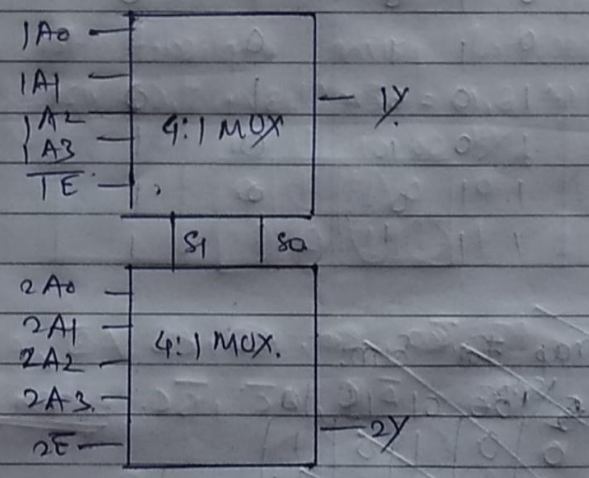
Solution:

IC74153:

- It is a dual 4:1 Demultiplexer IC.
- pin configuration of IC is as below:



- this Ic can also be represented as (to show in circuit diagrams)



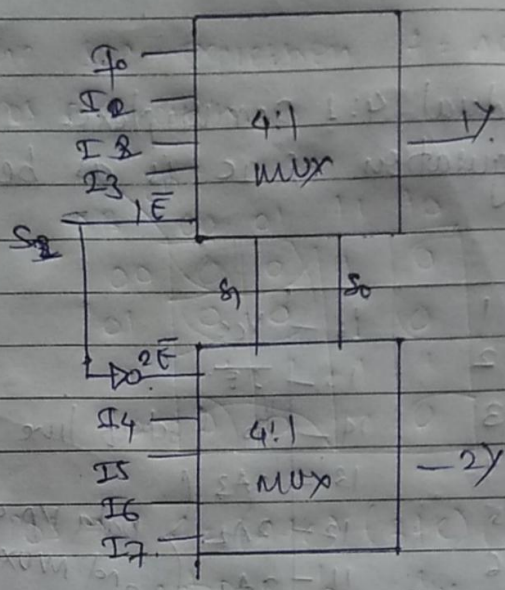
full adder using IC 74153:

→ full adder;

Sum: $f(A,B,C) = \Sigma m(1,2,4,7)$

Carry: $f(A,B,C) = \Sigma m(3,5,6,7)$

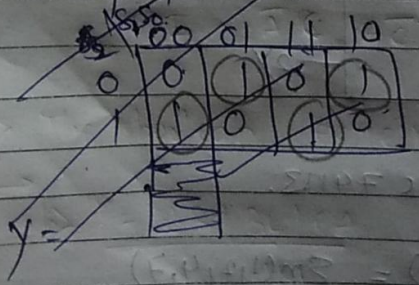
we have two convert this IC into 8:1 MUX.
for this we use enable input (pin 1 & 15)



truth table:

S2	S1	S0	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

K-map for Sum:



Q4 >>

16:1 MUX

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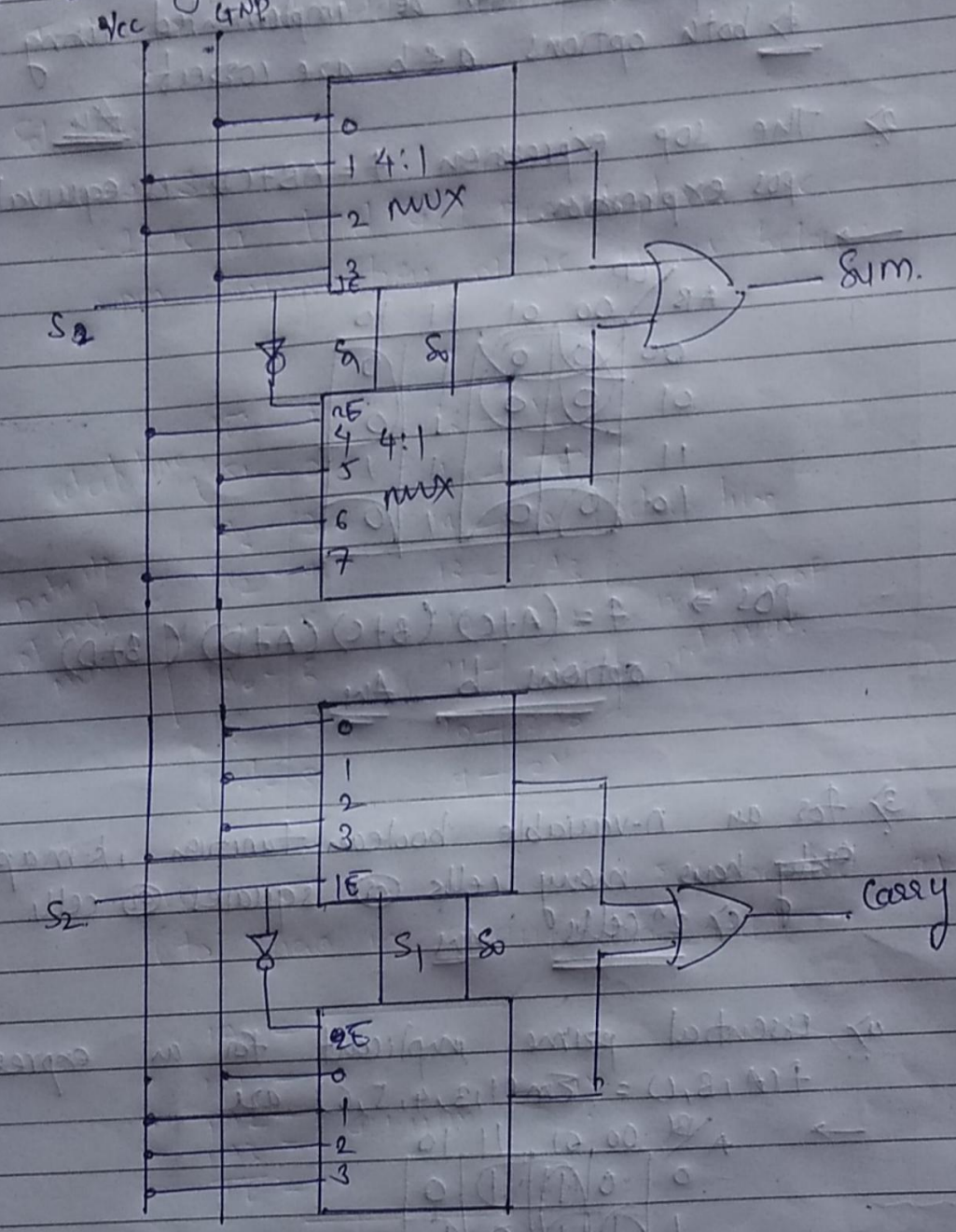
ckt diagram from truth table.



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9)

A)

1) POS expressions can be implemented using
   d) both options a & b are correct. Ans

2) The SOP expression $f = AB + CD$ is equivalent to pos expression.

→

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

POS → $f = (A+C)(B+C)(A+D)(B+D)$

option b Ans.

3) for an n-variable boolean function, k-map contains how many cells (or) squares (or) cells.
   c) 2^n cells Ans

4) Essential prime implicant for an expression $f(A,B,C) = \Sigma m(1,3,4,5,6)$ are

→

A \ BC	00	01	11	10
0	0	1	1	0
1	1	1	0	1

PI: ~~A~~, ~~B~~, ~~C~~, ~~AB~~ $A\bar{B}$, $A\bar{C}$, $\bar{A}C$, $\bar{B}C$

EPI: $\bar{A}B$, $A\bar{C}$, $\bar{B}C$ option b Ans

5) The boolean expression for y is

→

b) $Y = AB + BC + CA$

Ans

Q4 ⇒

16:1 MUX using 4:1 MUXES

→

16:1 MUX → 16 input & 1 output
also 4 select lines (S_0, S_1, S_2, S_3)

4:1 MUX → 4 input & 1 output.

∴ We require at least 4 4:1 MUXES.

1⇒ The Y_1, Y_2, Y_3, Y_4 outputs of first level muxes are connected as input to 2nd level mux.

2⇒ In 1st level input is selected by select lines

S_1, S_0 ← in 2nd level by select lines $S_2 \& S_3$

3) The output of the 2nd level MUX will be the output of circuit ie. output of 16:1 MUX.