

Sarita Sangre

23-2088

C4-A.

Date:

DLD Assignment 4

$z^2 \ z^1 \ z^0$

4.5. $x \ y \ z$ A \oplus \ominus B \ominus C no biexp

(0) 0 0 0 0 0 1 0 = A:

(1) 0 0 1 0 1 0 0 = B:

(2) 0 1 0 0 0 1 0 = C:

(3) 0 1 1 1 0 0 0 = D:

(4) 1 0 0 0 0 0 0 = E: $A = y^2 + xy'$

(5) 1 0 1 0 0 1 0 = F: $B = y^2 + yz'$

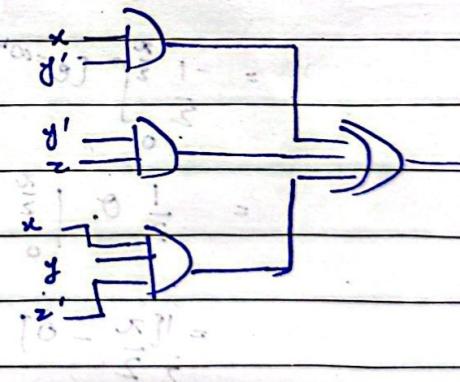
(6) 1 1 0 1 0 0 0 = G: $C = y^2 + yz'$

(7) 1 1 1 1 0 1 0 = H: $D = y^2 + yz'$

B:

	y^2	00	01	11	10
0	0	0	1	1	0
1	1	1	1	0	0

$$B = xy' + y^2 + xy^2$$



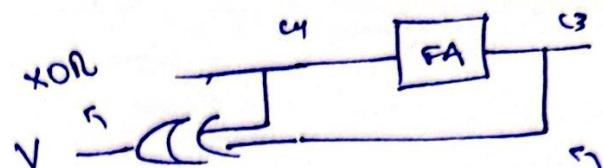
C:

	y^2	00	01	11	10
0	0	1	0	1	0
1	1	1	1	1	0

$$C = x'y' + xz$$



Date:



$$4 \cdot 13. \text{ a) } \begin{array}{r} 0 \\ + 0 \\ \hline 0 \end{array}$$

sum

carry

C_0

M

$$\begin{array}{r} 0 \\ + 1 \\ \hline 1 \end{array}$$

1101

0

V

0

$$\text{b) } \begin{array}{r} 1000 \\ + 1001 \\ \hline 10001 \end{array}$$

sum

carry

V

0

$$\text{c) } \begin{array}{r} 1100 \\ + 1000 \\ \hline 10100 \end{array}$$

sum

carry

V

1

$$\begin{array}{r} 0001 \\ + 1 \\ \hline 0000 \end{array}$$

$$\text{d) } \begin{array}{r} 0010 \\ + 0110 \\ \hline 1011 \end{array}$$

sum

carry

V

1

$$\begin{array}{r} 0100 \\ + 1 \\ \hline 0110 \end{array}$$

$$\text{e) } \begin{array}{r} 0000 \\ + 1111 \\ \hline 0001 \end{array}$$

sum

carry

V

1

$$= 1110$$

$$\begin{array}{r} \uparrow \\ 1111 \end{array}$$

4 · 14

XOR

AND

OR

XOR

$$10 + 5 + 5 + 10 = 30 \text{ ns.}$$

$$A \oplus A = 0$$

$$4 \cdot 20 \text{ bits } D = A_3 \oplus A_2, A_1, A_0$$

$$B_3 \quad B_2 \quad B_1 \quad B_0$$

$$A_3 B_0 \quad A_2 B_0 \quad A_1 B_0 \quad A_0 B_0$$

$$A_3 A_3 \quad B_1 A_2 \quad B_1 A_1 \quad B_1 A_0 \quad x$$

$$B_2 A_3 \quad B_2 A_2 \quad B_2 A_1 \quad B_2 A_0 \quad x \quad x$$

$$B_3 A_0 \quad B_3 A_2 \quad B_3 A_1 \quad B_3 A_0 \quad x \quad x$$

$$B_3 A_0 \quad B_2 A_3 \quad A_3 A_3 \quad A_3 B_0 \quad A_2 B_0 \quad A_1 B_0 \quad A_0 B_0$$

$$+ B_3 A_0 \quad + B_2 A_2 \quad + A_3 A_2 \quad + B_2 A_1 \quad + A_2 A_1 \quad + B_1 A_0 \quad + B_0 A_0$$

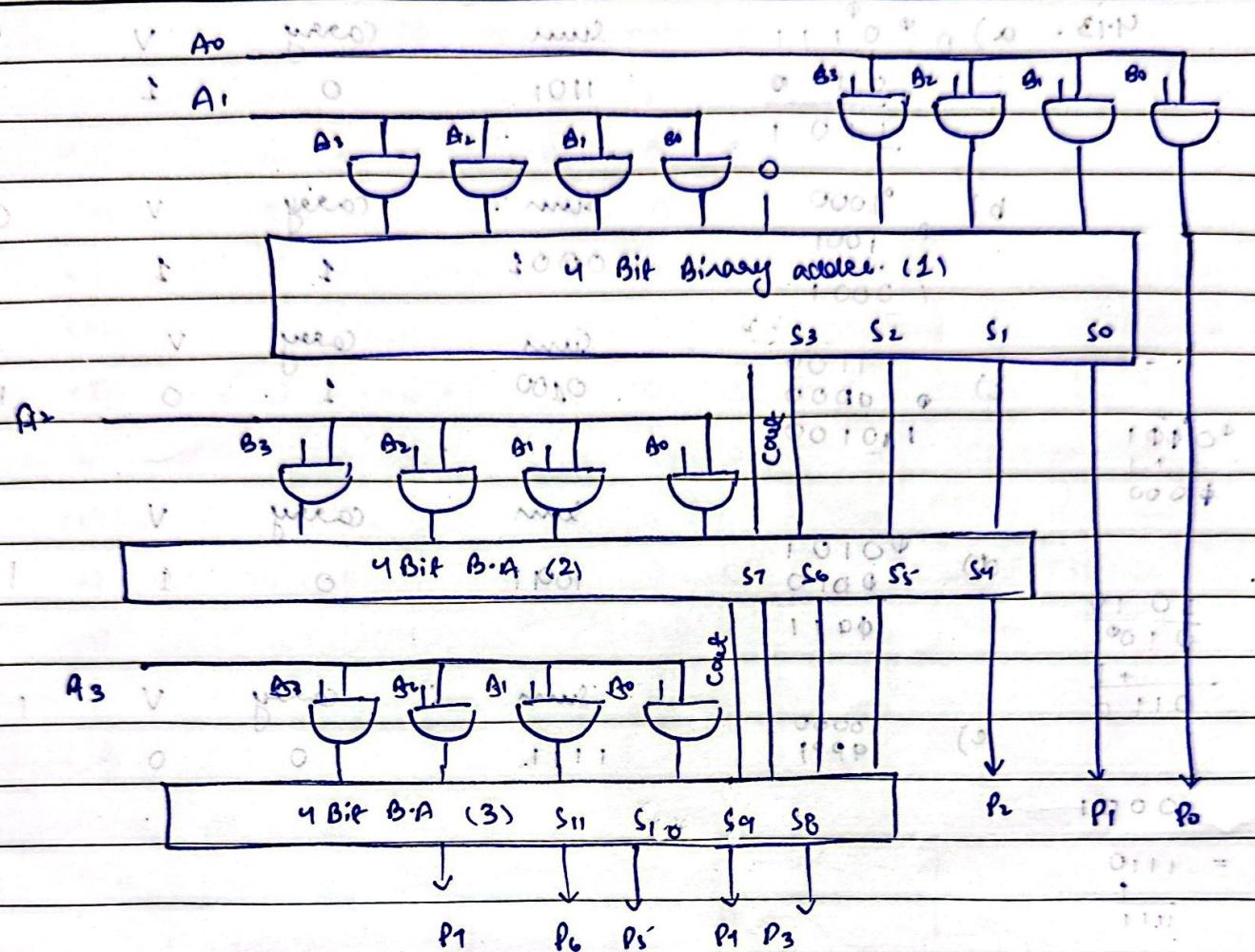
$$C_5 \quad C_4 \quad C_3 \quad C_2 \quad C_1 \quad C_0 \quad P_0$$

$$P_1 \quad P_0 \quad P_5 \quad P_2 \quad P_1 \quad P_0 \quad P_4$$

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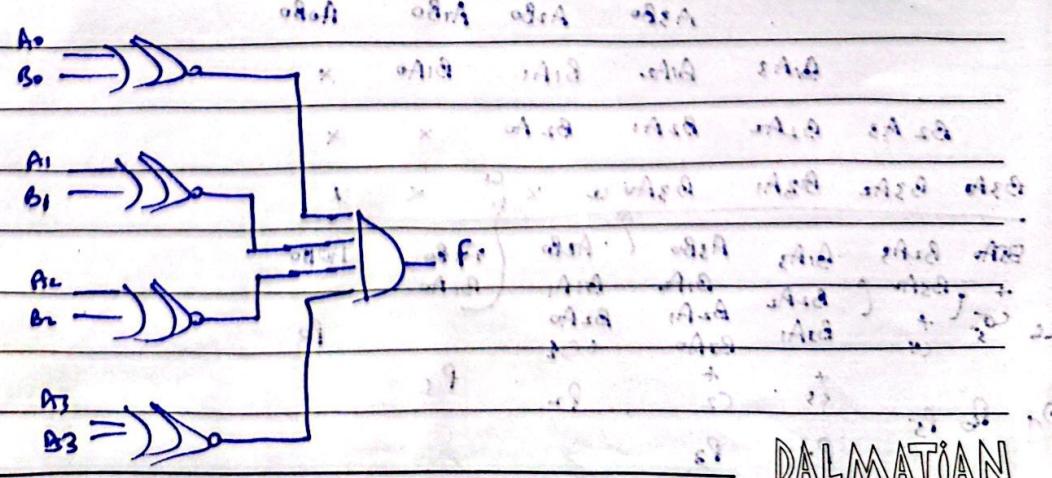


4.21	A	B	$A = \overline{B} \oplus B$	S_0	S_1	S_2	S_3	S_4	S_5	S_6	S_7
	0	0	$\overline{0} \oplus 0 = 1$	1	0	0	0	0	0	0	0
	0	1	$\overline{0} \oplus 1 = 1$	0	1	0	0	0	0	0	0
	1	0	$\overline{1} \oplus 0 = 0$	0	0	1	0	0	0	0	0
	1	1	$\overline{1} \oplus 1 = 0$	0	1	1	0	0	0	0	0

$A = \overline{B} \oplus B$

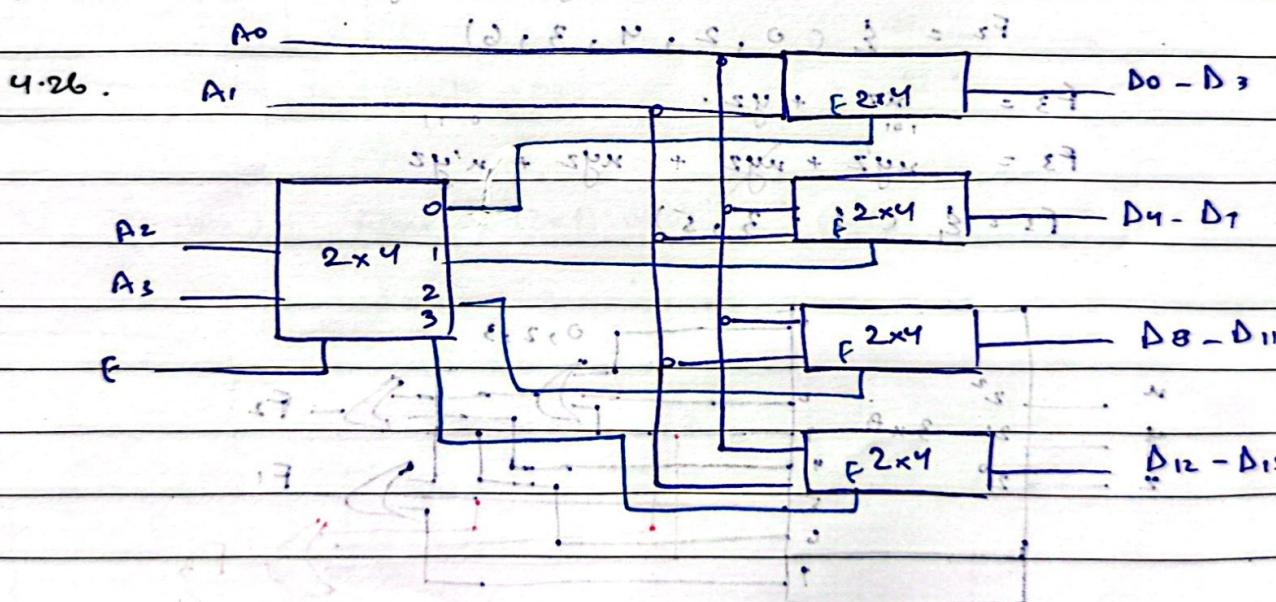
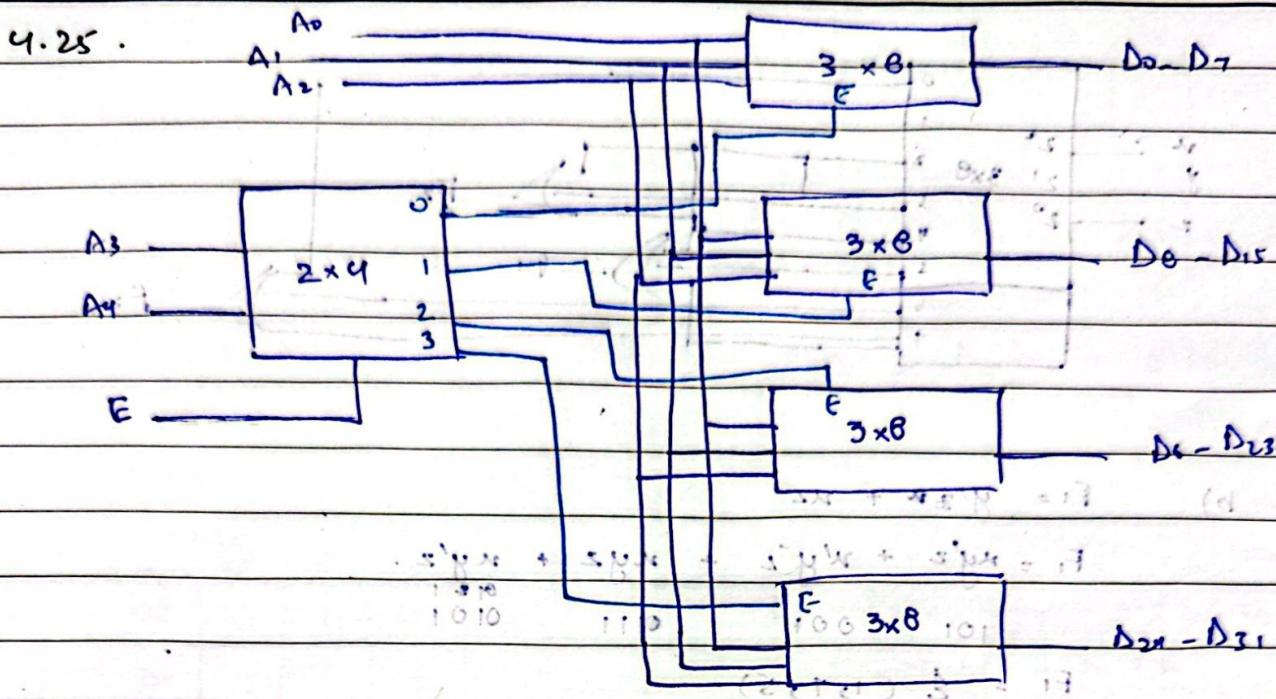
$F = \overline{A} \oplus B$

$0 \oplus 0, 1 \oplus 0, 0 \oplus 1, 1 \oplus 1 = 4 \text{ Bits} = 4 \text{ XNOR gates}$



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$$4.28. F_1 = \overline{w}yz' + \overline{w}z(y + y')$$

$$F_1 = \overline{w}yz' + \overline{w}yz + \overline{w}y'z \quad F_1 = \Sigma(2, 7, 5)$$

$$(0) \quad F_2 = \overline{w}y'z' + wyz + w'yz' \quad F = \Sigma(2, 3, 4) \quad \text{minimizing out}$$

$$(0) \quad F_3 = w'y'z' + w'yz + w'yz' \quad F = \Sigma(0, 6, 7) \quad \text{minimizing out}$$

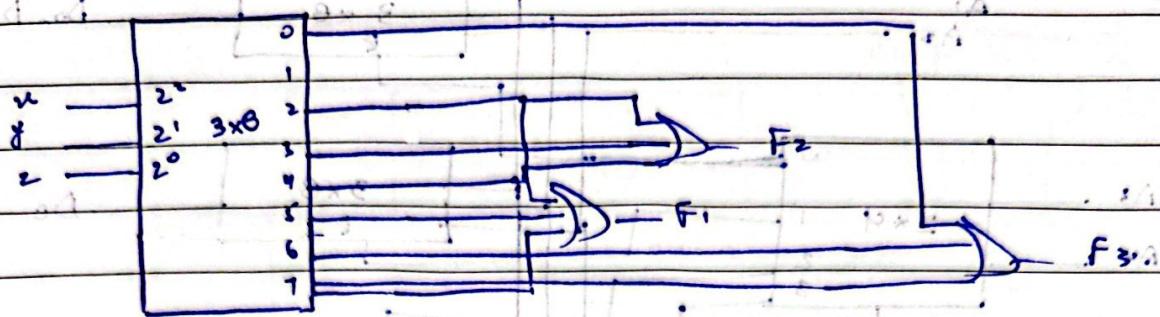
$$(E) \quad \begin{matrix} 1 & 1 & 0 & 0x & 1x & x & x0 \end{matrix}$$

$$(E) \quad \begin{matrix} 1 & 0 & 1 & 0 & 0 & 1 & x \end{matrix}$$

$$(E) \quad \begin{matrix} 1 & 1 & 1 & 1 & 0 & 0 & 1 \end{matrix}$$

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$$b) \quad F_1 = y'z + uz$$

$$F_1 = \underline{u}y'z + \underline{u}y'z + \underline{u}yz + \underline{u}yz$$

$$F_1 = \sum (1, 7, 5)$$

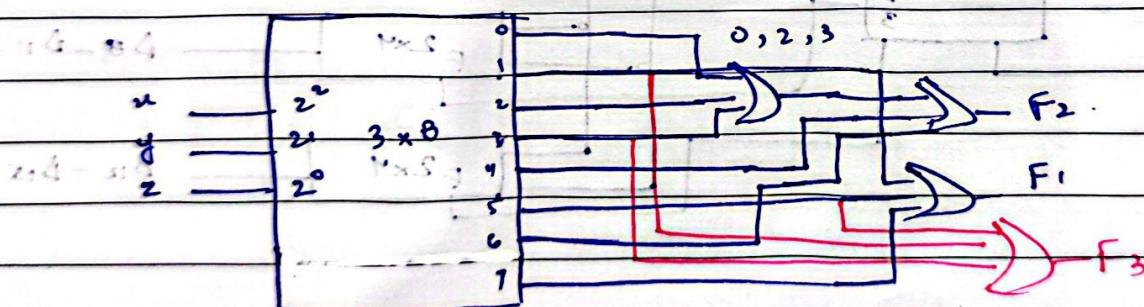
$$F_2 = \underline{u}y'z' + \underline{u}'y'z' + \underline{u}'yz + \underline{u}'yz' + \underline{u}yz' + \underline{u}'yz'$$

$$F_2 = \sum (0, 2, 4, 3, 6)$$

$$F_3 = \underline{u}z + yz$$

$$F_3 = \underline{u}yz + \underline{u}yz + \underline{u}yz + \underline{u}'yz$$

$$F_3 = \sum (3, 3, 5)$$



$$4.29. (2, 1, 0, 3) < D_2 \wedge D_1 < D_3 + \underline{u}0 + \underline{u}0 = V$$

low priority encoder: $(0, 0, 0, 1, 0, 1, 0, 1) \oplus (0, 0, 0, 1, 0, 1, 0, 1) = (0, 0, 0, 1, 1, 1, 1, 1)$

$x \quad x \quad 1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1 \quad (1)$

$x \quad 1 \quad 0 \quad 0 \quad 1 \quad 0 \quad 1 \quad 1 \quad (2)$

$1 \quad 0 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1 \quad 1 \quad (3)$

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For O_1 :

		$D_1 D_0$	00	01	11	10
1 16		$D_3 D_2$	X			
16 8		00	1			
2x4		01				
3x2		11	1			
4x1		10	1			

$$O_1 = D_1' D_0'$$

For O_2 :

		$D_1 D_0$	00	12	01	32	11	52	10	62
1		$D_2 D_1$	X							
00		00	1							
01		01								
11		11	1							
10		10	1							

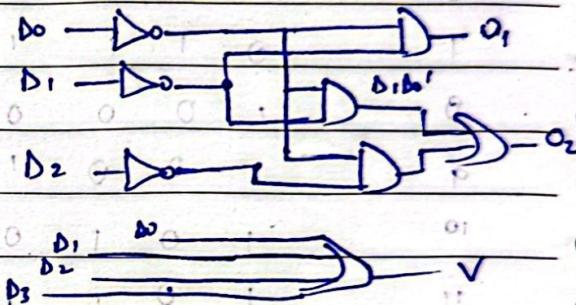
$$O_2 = D_0' D_2' + D_1 D_0'$$

For V :

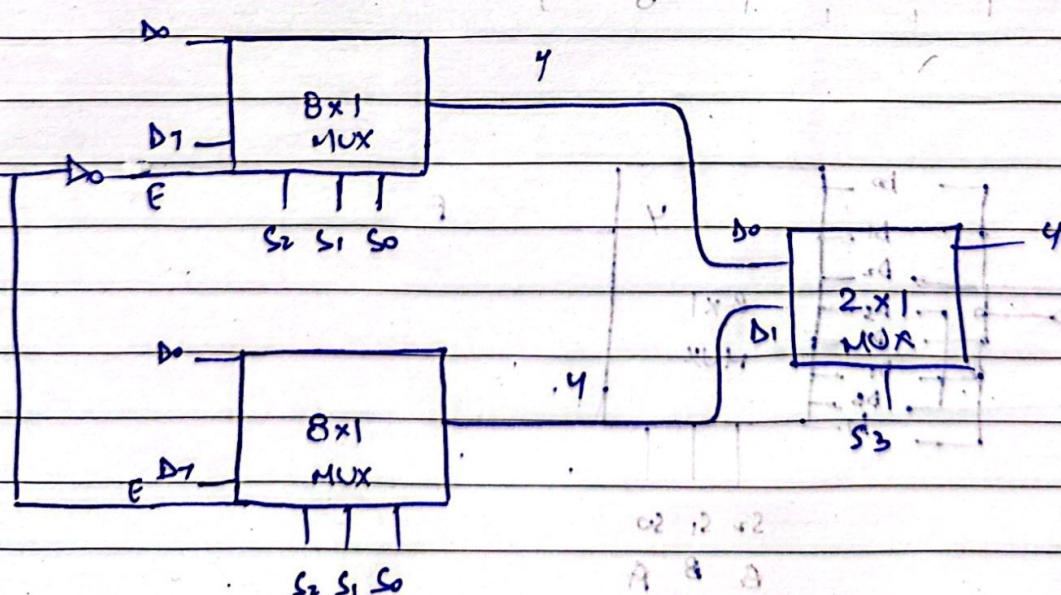
		$D_3 D_2$	00	01	11	10
00		$D_3 D_2$	0	1	1	1
01		00	1	1	1	1
11		01	1	1	1	1
10		10	1	1	1	1

$$V = D_0 + D_1 + D_2 + D_3.$$

Circuit:



4.31 16x1 from 1 (2x2) and 2 (8x1)



Date:

4.32.

a) A B C D F

0 0 0 0 1 } $D_0 = \bar{B}$

1 0 0 0 1 } 0 } $D_1 = \bar{B}$

2 0 0 1 0 } 1 } $D_2 = \bar{B}$
3 0 0 1 0 } 0 } $D_3 = \bar{B}$

4 0 1 0 0 } 0 } $D_4 = B$

5 0 1 0 0 } 1 } $D_5 = B$

6 0 1 1 0 } 0 } $D_6 = 0$

7 0 1 1 0 } 0 } $D_7 = 0$

8 1 0 0 0 } 1 } $D_8 = \bar{B}$

9 1 0 0 0 } 0 } $D_9 = B$

10 1 0 1 0 } 1 } $D_{10} = \bar{B}$

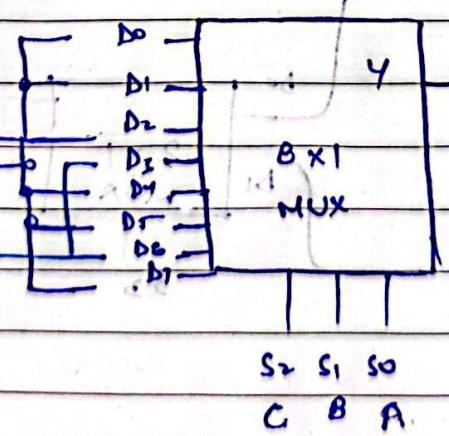
11 1 0 1 0 } 0 } $D_{11} = B$

12 1 1 0 0 } 0 } $D_{12} = 0$

13 1 1 0 0 } 0 } $D_{13} = 0$

14 1 1 1 0 } 1 } $D_{14} = \bar{B}$

15 1 1 1 1 } 0 } $D_{15} = B$



$$F = (A + B' + C' + D) * (A + B + C + D) * (A' + B' + C + D)$$

$$(A'B'C'D') + (A'B'C'D')$$

$$+ (A'B'C'D)$$

Date:

$$b) F = \pi(6, 2, 11) = (A' + B' + C + D') (A' + B + C + D) (A + B' + C + D)$$

A B C D

F

$$F' = (A' + B' + C + D')' (A' + B + C + D)' (A + B' + C + D)'$$

(0) 0 0 0 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_0 = 1 (A + B' + C + D)'$$

(1) 0 0 0 1

$$F' = (ABC'D) + (AB'C'D) + (A'B'C'D)$$

(2) 0 0 1 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_1 = 1 \Sigma(13, 9, 4)$$

(3) 0 0 1 1

$$F = \Sigma(0, 1, 2, 3, 5, 6, 7)$$

(4) 0 1 0 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_2 = D E, 10, 11, 12, 14, 15$$

(5) 0 1 0 1

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_3 = 1$$

(6) 0 1 1 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_4 = 1$$

(7) 0 1 1 1

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_5 = 1$$

(8) 0 0 0 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_6 = 1$$

(9) 1 0 0 1

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_7 = \bar{D}$$

(10) 1 0 1 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_8 = 1$$

(11) 1 0 1 1

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_9 = 1$$

(12) 1 1 0 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_{10} = \bar{D}$$

(13) 1 1 0 1

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_{11} = 1$$

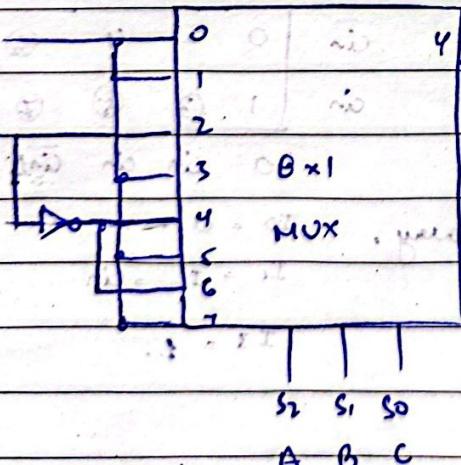
(14) 1 1 1 0

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_{12} = 1$$

(15) 1 1 1 1

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} D_{13} = 1$$

2. 3. 4. 5. 6. 7.



DALMATIAN

4.33.

Date: selector
lines we make
table.

2 outputs

Inputs

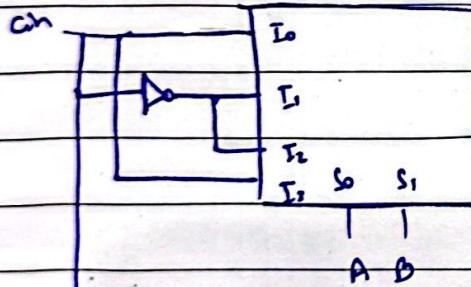
Outputs

A	B	Cin	Sum	Carry	I ₀	I ₁	I ₂	I ₃
0	0	0	0	0	0	0	0	I ₀
0	0	1	1	0	1	0	0	I ₁
0	1	0	1	0	0	1	0	I ₂
0	1	1	0	1	1	1	0	I ₃
1	0	0	1	0	0	0	0	I ₀
1	0	1	0	1	I ₀	I ₁	I ₂	I ₃
1	1	0	0	1	I ₀	I ₁	I ₂	I ₃
1	1	1	1	1	I ₀	I ₁	I ₂	I ₃

for sum: $\bar{A}\bar{B} \bar{Cin} = 2$

for carry: $\bar{A}\bar{B} \bar{Cin} = 2$

we will do numbering 5



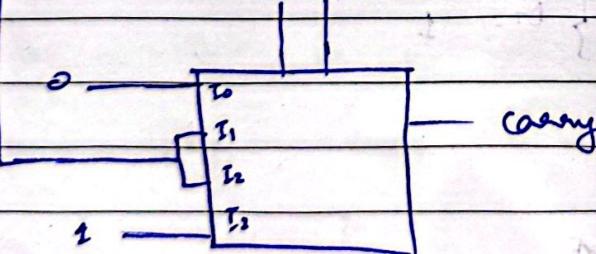
$$\text{Sum} = \Sigma (1, 2, 4, 7)$$

$$\text{Carry} = \Sigma (3, 5, 6, 7)$$

circle sum • check corresponding
cin.

$$\text{Sum: } I_0 = I_3 = \text{cin}$$

$$I_1 = I_2 = \bar{\text{cin}}$$



$$\text{for carry: } I_0 = I_1 = I_2 = I_3$$

$$\bar{\text{cin}} = 0 \quad 2 \quad 4 \quad 6$$

$$\text{cin} = 1 \quad 3 \quad 5 \quad 7$$

$$0 \quad \text{cin} \quad \text{cin} \quad 4$$

$$\text{carry, } I_0 = 0$$

$$I_1 = I_2 = \text{cin}$$

$$I_3 = 1$$

Date:

4.34.

a) A B C D F

$$\begin{array}{cccccc} 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 & 1 \end{array} \left\{ I_0 = D \right.$$

$$\begin{array}{cccccc} 2 & 0 & 0 & 1 & 0 & 1 \\ 3 & 0 & 0 & 1 & 1 & 1 \end{array} \left\{ I_1 = D \right.$$

$$\begin{array}{cccccc} 4 & 0 & 1 & 0 & 0 & 0 \\ 5 & 0 & 1 & 0 & 1 & 0 \end{array} \left\{ I_2 = D \right.$$

$$\begin{array}{cccccc} 6 & 0 & 1 & 1 & 0 & 1 \\ 7 & 0 & 1 & 1 & 1 & 1 \end{array} \left\{ I_3 = D \right.$$

$$\begin{array}{cccccc} 8 & 1 & 0 & 0 & 0 & 0 \\ 9 & 1 & 0 & 0 & 1 & 0 \end{array} \left\{ I_4 = D \right.$$

$$\begin{array}{cccccc} 10 & 1 & 0 & 1 & 0 & 1 \\ 11 & 1 & 0 & 1 & 1 & 1 \end{array} \left\{ I_5 = D \right.$$

$$\begin{array}{cccccc} 12 & 1 & 1 & 0 & 0 & 0 \\ 13 & 1 & 1 & 0 & 1 & 0 \end{array} \left\{ I_6 = D \right.$$

$$\begin{array}{cccccc} 14 & 1 & 1 & 1 & 0 & 0 \\ 15 & 1 & 1 & 1 & 1 & 0 \end{array} \left\{ I_7 = D \right.$$

at zero.

00	01	11	10	11	10	00	01	11	10	00	01	11	10	00	01	11	10	00	01	
0	1	3	2	1	2	0	1	3	2	0	1	3	2	0	1	3	2	0	1	
1	2	4	5	6	7	0	1	3	2	0	1	3	2	0	1	3	2	0	1	
2	3	5	6	7	8	0	1	3	2	0	1	3	2	0	1	3	2	0	1	

$$F = \{1, 6, 7, 9, 10, 11, 12\}$$

b) A B C D F

$$\begin{array}{cccccc} 0 & 1 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 1 \end{array} \left\{ I_8 = D \right.$$

$$\begin{array}{cccccc} 1 & 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 & 1 \end{array} \left\{ I_9 = D \right.$$

$$\begin{array}{cccccc} 1 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 1 \end{array} \left\{ I_{10} = D \right.$$

$$\begin{array}{cccccc} 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 \end{array} \left\{ I_{11} = D \right.$$

$$\begin{array}{cccccc} 1 & 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 & 0 \end{array} \left\{ I_{12} = D \right.$$

DALMATIAN

10	11	13	2	4	5	6	7	1	3	2	0	1	3	2	0	1	3	2	0	
4	5	7	6	12	13	14	15	8	10	9	1	2	3	11	1	10	9	8	7	
12	13	14	15	10	9	8	7	1	3	2	0	1	3	2	0	1	3	2	0	
8	9	11	10	1	2	3	1	1	3	2	0	1	3	2	0	1	3	2	0	

$$F = \{0, 1, 6, 7, 9, 13, 14, 15\}$$

Date:

0
1
0
1
1

0
0
0

23/10/2022

Q.35 a) A B C D F

0 0 0 0 0

0 0 0 1 1

$AB = 00$

$F = D$

0 0 1 0 0

0 0 1 1 1

0 1 0 0 1

$AB = 01$

$F = \overline{CD}$

$= (C+D)'$

0 0 1 0 1 0 0

0 1 0 0 0 0 0

1 0 0 0 0 0 0

$AB = 10$

$F = CD$

1 0 1 0 0 1 0

1 1 0 0 0 0 0

1 1 0 0 0 0 0

$AB = 11$

$F = 1$

1 1 1 0 1 1 1

1 1 1 1 1 1 1

1 1 1 1 1 1 1

b) A B C D F

$AB = 00$

$F = CB + CD$

xor

$AB = 01$

$F = C'D + CD$

$= D$

$AB = 10$

$F = CD + C'D + CD$

$= C'D + D$

$AB = 11$

looked at
above
table.

