CODE: H8YL.

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Qs. Paper:

Q1. Draw
$Y = AB' + BC + CDE'$
using 2 input NAND gates.
gate input cost = ?
Standard 2 level SOP = ?.
Show how Y can be used made. 16 to 1 MUX.

Q2. PI = ?
prime implicant
What makes PI non essential
i/p? to 1 to 4 if $F(W, X, Y, Z) = \Sigma m$ (6, 7, 12, 13)

Q3. minimal & combined min.
$F_1 = \Sigma m(0, 1, 5, 6, 7, 13, 14, 15)$
$F_2 = \Sigma m(4, 5, 6, 10, 11, 12, 13, 14)$.

Q4. $A = (111011)_2$
$B = (101001)_2$
A - B using 2's complement
How to detect overflow using binary adder?
Usefulness of Openable in IC 74257 nibble MUX?.

Q1. $Y = \overline{(A\bar{B}) \cdot (\bar{B}C) \cdot (C\bar{D}\bar{E})}$

NAND gate.

Answers.

Q1.

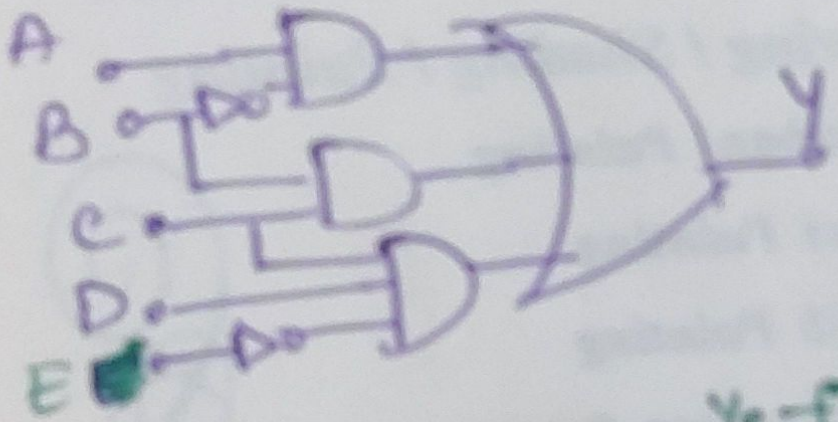
$Y = AB' + BC + CDE'$.

Gate input cost = T + L + N

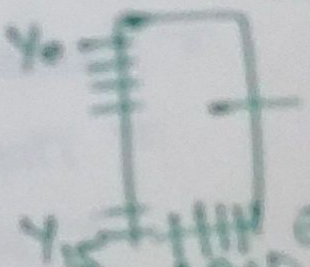
(G) = 7 + 3 + 2 = 12.

using 2 level SOP.

= 10 + 2 = (12).



MUX.



$Y = A' \cdot Y(0, B, C, D) + A \cdot Y(1, B, C, D)$.

using simplification expression.

$Y = A' \cdot (BC + CD \cdot E') + A \cdot (B + BC + CDE')$.

$A + C + CDE'$

$= A' \cdot (B' + B \cdot (C + CDE')) + A \cdot (B' + BC + CDE')$.

$Y = A' \cdot [Y(0, B, C, D, E)]$

$+ A \cdot [Y(1, B, C, D, E)]$

$Y = A' \cdot B' (Y(0, 0, C, D, E)$

$+ A' \cdot B (Y(0, 1, C, D, E))$

$+ A \cdot B' (Y(1, 0, C, D, E))$

$+ A \cdot B (Y(1, 1, C, D, E))$

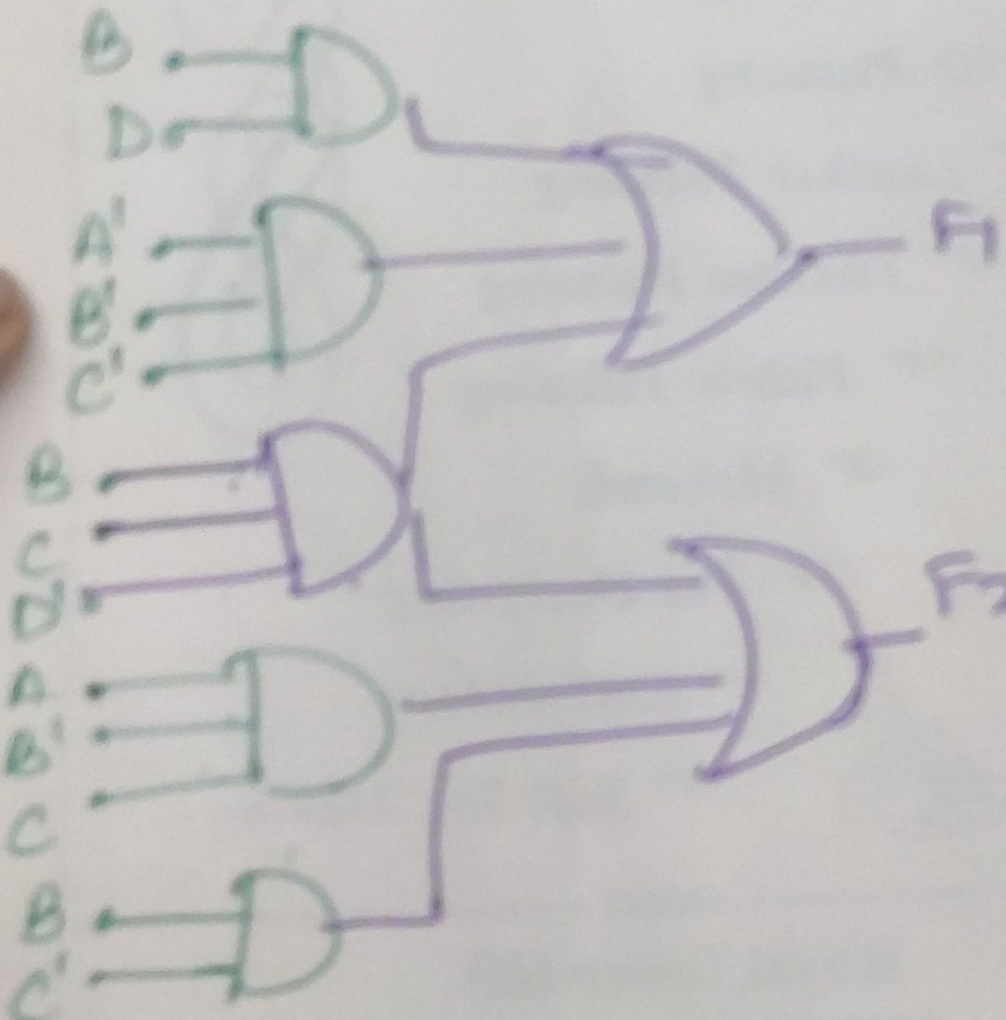
Q3. COMBINED. Answers.

$F_1 = BCD' + BD + A'B'C'$

$F_2 = BCD' + BC' + AB'C.$

∴ Total cost = 18 + 5 = 23

∴ Combined minimization is better than individual min of total cost of F_1, F_2.



Q3. INDIVIDUAL. Answers.

$F_1 = \Sigma m(0, 1, 5, 6, 7, 13, 14, 15)$.

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

$= A'B'C' + BD + BC$

TC = total cost = no. of gate inputs + no. of gates.

$F_2 = \Sigma m(4, 5, 6, 10, 11, 12, 13, 14)$.

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

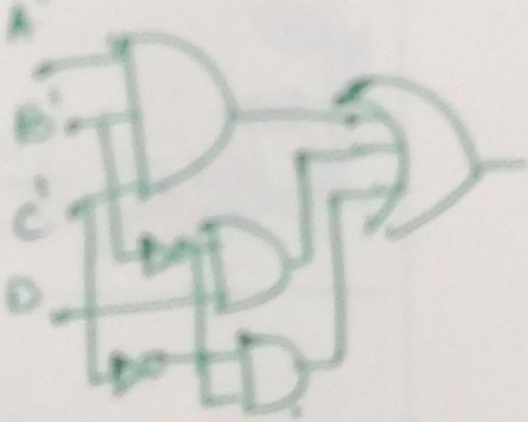
$= AB'C + BC' + BD'$

$TC_{F1} = 10 + 4 = 14$.

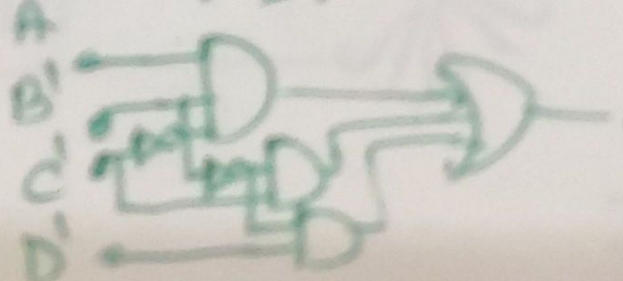
$TC_{F2} = 10 + 4 = 14$.

Total cost individual $= 14 + 14 = 28$

F1



F2.



Q2. Answers

Prime Implicant (PI).

A group of square or rectangle with bunch of adjacent impedance is allowed by definition of K map

If all groups are printed from K map

→ If group covers min-terms that can also be covered by another prime implicant then the PI becomes non-essential.

$F(w,x,y,z) = \sum m(6,7,12,13)$.

wx \ yz	00	01	11	10
00	0	0	0	0
01	0	0	1	1
11	1	1	0	0
10	0	0	0	0

$= ABC' + A'BC$.

$= B(AC' + A'C)$

$= B(A \oplus C)$.

$= WXY' + W'XY$

$= (WY' + W'Y)X$

$= X.(W \oplus Y)$.

If PS → 1=X, 2=W, 3=X, 4=Y

only then $F = XW \oplus XY$

Essential PI always cover atleast min-terms that can't be covered by any other PI.

ie one final solution.

Q4. Answers.

A 111011
B 101001

2's complement of B.

−B. 010110 {invert}
+ 1 {+1}
010111

∴ A 111011
−B + 010111
1010010
carry

Ans.

∴ A−B. = (1)01000 10 = $(01000 10)_2$.
carry.

$(59)_{10}$ $(41)_{10}$ $= (18)_{10}$.

Overflow can be detected using XOR gate. for carry generated during addition.

Overflow = $C_2 \oplus C_1$, if 2 gates are there

• output enable (en) in 74257 - Nibble MUX. when en=0, output is high impedence or dependent on the specific device. when en=1, MUX performs is selection