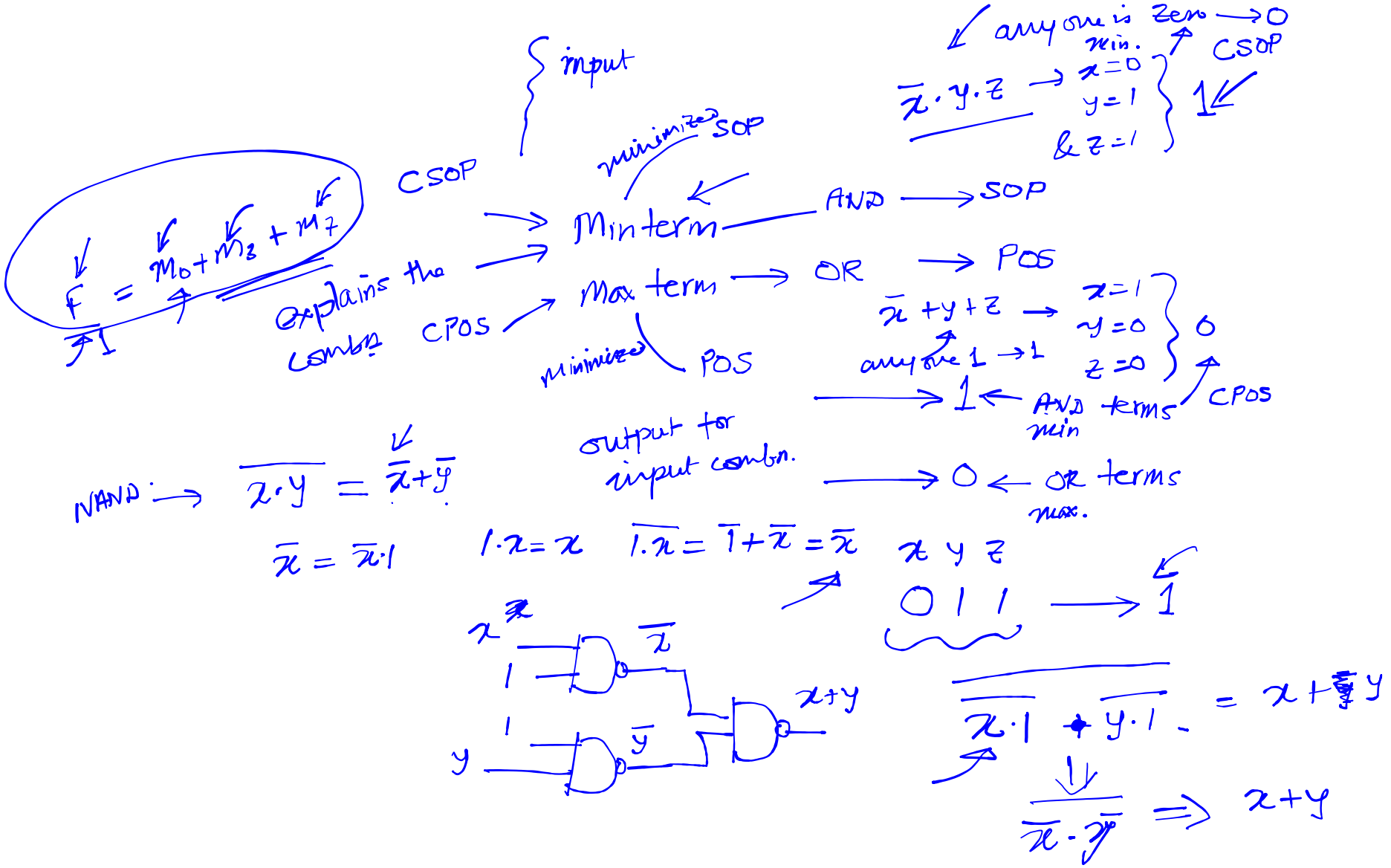
input
CSOP
minimize SOP
Minterm
AND → SOP
Max term → OR → POS
minimized POS
explains the combn
CPOS
any one is zero → 0
x̄·y·z → x=0, y=1 & z=1
min.
CSOP
1
x̄+y+z → x=1, y=0, z=0
any one 1 → 1
0
CPOS
1 ← AND terms
min
output for input combn.
0 ← OR terms
max.
NAND: → x·y = x̄+ȳ
x̄ = x̄·1
1·x = x
1·x̄ = 1̄+x̄ = x̄
x y z
0 1 1 → 1
x
x̄
1
y
ȳ
x+y
x̄·1 + ȳ·1 = x+y
x̄·ȳ ⇒ x+y

Logic Synthesis

- Implement function using NOT, OR and AND gates in POS

$$f(D,C,B,A) = \prod M(1,2,3,7)$$

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

This reduces to $f = (A + B)(C + \bar{B})(\bar{A} + C + D)$

Take over from here and carry out a process (like what we did for implementation using NOT, AND and OR gates) to implement using NOT, OR and AND gates

Replace this slide by the next slide.

Logic Synthesis:

- Implement function using NOT, OR and AND gates in POS

$$f(D,C,B,A) = \prod M(0,2,3,4,8,10,11,12,13,15)$$

$$f(D,C,B,A) = (D+C+B+A)\cdot(D+C+\bar{B}+A)\cdot(D+C+\bar{B}+\bar{A})\cdot(D+\bar{C}+B+A)\cdot(\bar{D}+C+B+A)\cdot(\bar{D}+C+\bar{B}+A)\cdot(\bar{D}+C+\bar{B}+\bar{A})\cdot(\bar{D}+\bar{C}+B+A)\cdot(\bar{D}+\bar{C}+B+\bar{A})\cdot(\bar{D}+\bar{C}+\bar{B}+\bar{A})$$

This reduces to $f = (A+B)(C+\bar{B})(\bar{A}+C+D)$

Take over from here and carry out a process (like what we did for implementation using NOT, AND and OR gates) to implement using NOT, OR and AND gates

Logical Statements -> Boolean Expressions -> Logical Networks

Abhishek will attend the DC class (A) if his friend Manav is attending the class (M) and Sheela is busy (S) or the topic being covered in class is important from examination point of view (T) and Manav is not attending the class (~M) or there is a quiz (Q). Write the expression for output which goes high when Abhishek attend the class.

are not available in Mano Practice Problems.

$$A = M\bar{S} + \bar{M}T + Q$$

The board of directors of a bank consists of two directors (D_1, D_2) and a managing director (MD). Assign binary variables X, Y and Z to indicate a working day, Saturday and Sunday respectively.

1. The vault of the bank can be opened on working days either by any two directors together or by the managing director.
2. On Saturdays, any one of the directors and the managing director can together open the vault
3. While on Sundays, all three have to be present to open the vault.

Obtain a Boolean expression for the condition to be satisfied for opening the vault (V) in terms of the binary input variables D1, D2, MD, X, Y and Z.

$$V = X \cdot (D1 \cdot D2 + MD) + Y \cdot (D1 + D2) \cdot MD + Z \cdot D1 \cdot D2 \cdot MD$$

- A student has to decide whether he will buy the textbook prescribed for a course he is going to take. The considerations are:

Variables defined

(a) Cost of the book – Could be LOW/ MEDIUM/ HIGH ⟶ C_1C_0

(b) Quality of the teacher – Could be AVERAGE/ GOOD/ EXCELLENT ⟶ T_1T_0

(c) Quality of lecture notes – Could be GOOD / AVERAGE ⟶ L

(d) The book being useful in other courses also – Could be YES / NO ⟶ U

1. Gagan would like to buy the book if its cost is LOW. However, either if the teacher is EXCELLENT or GOOD and gives GOOD lecture notes, he feels that he may not have to buy the book.
2. If the teacher is AVERAGE, and the book is useful in other courses also, he would prefer to buy the book, whatever its cost.
3. If the book is useful in other courses, he would buy it in any case provided its cost is not HIGH.

Obtain a Boolean expression for the output Y representing the decision to buy the book.

LECTURE NOTES: GOOD L =1; AVERAGE L = 0

USEFUL IN OTHER COURSES: YES U = 1, NO U = 0

Cost of the book

C_1	C_0	Cost
0	0	LOW
0	1	LOW
1	0	MEDIUM
1	1	HIGH

Quality of the teacher

T_1	T_0	Quality
0	0	AVERAGE
0	1	AVERAGE
1	0	GOOD
1	1	EXCELLENT

$$B = \overline{C_1} \cdot (T_1 \cdot L) + \overline{T_1} \cdot U + U \cdot (\overline{C_1 \cdot C_0})$$

H. W. --- Will discuss in the next class if you are not able to solve it.

A student staying in a hostel has to make up his mind about his dinner. If he has enough money (*M*) and at least three of his friends (*F*) also agree to go out for dinner, and it is not raining (R), he will have dinner with his friends in a restaurant outside the campus. If he is not able to go out, but at least three of his friends agree to join him (*J*), if the kind of food he wanted is available on home delivery (*K*) he will order home delivery of food from outside. But, ~~or~~ if the general feeling is that the food in the hostel mess is good on that day (*G*), he will have his dinner in the hostel mess. Let his decision be denoted by a 2-bit output D_1D_0:

$\mathbf{D_1D_0}$ = 00 $\Rightarrow$ He eats in the hostel mess,

$\mathbf{D_1D_0}$ = 01 $\Rightarrow$ He goes out to have dinner in a restaurant, and

$\mathbf{D_1D_0}$ = 10 $\Rightarrow$ He orders food through home delivery.