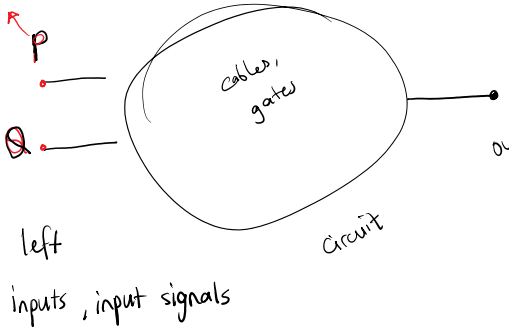
2nd Week's Friday

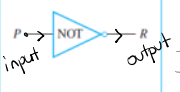
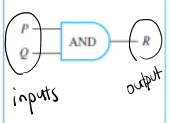
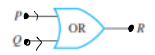
13 Ekim 2023 Cuma 09:31

1 → T
0 → F
Boolean variables (P, Q, ...) → simple statements
Boolean expressions → compound statements
~, ∧, ∨,



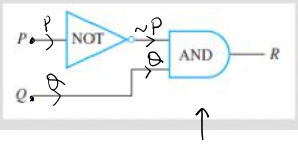
inputs, input signals

circuit — input-output table

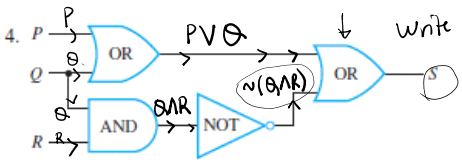
	circuit	Input	Output
NOT		P	R
		1	0
		0	1
AND		P Q	R
		1 1	1
		1 0	0
		0 1	0
		0 0	0
OR		P Q	R
		1 1	1
		1 0	1
		0 1	1
		0 0	0

1) The Boolean Expression Corresponding to a Circuit

! Combine from left to right..



~P ∧ Q

4. 

→ input signals: $P = 0$, $Q = 0$, $R = 0$

write the Boolean exp. corresponding to circuit.

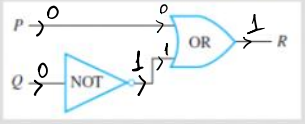
$(P \vee Q) \vee \sim(Q \wedge R)$

$0 \vee 0$; $0 \wedge 0$; $\sim 0 = 1$

$0 \vee 1 = 1$ → output

2) Constructing the Input/Output Table for a Circuit

Ex



Input		Output
P	Q	R
1	1	1
1	0	1
0	1	0
0	0	1

← find the input-table

input		output
P	Q	R
1	1	1
1	0	1
0	1	0
0	0	1

3) The Boolean Expression Corresponding to a ~~Circuit~~ input-output table

1. Identify the rows where the Output is 1.
2. For each such row, construct an AND expression that produces a 1 for the exact combination of input values.
3. Use an OR connective at the end.

Ex

Input			Output
P	Q	R	S
1	1	1	1
1	1	0	0
1	0	1	1
1	0	0	1
0	1	1	0
0	1	0	0
0	0	1	0
0	0	0	0

$(P \wedge Q \wedge R) \vee (P \wedge \sim Q \wedge R) \vee P \wedge \sim Q \wedge \sim R)$

?

1 → $(P \wedge Q \wedge R)$ ✓
3 → $(P \wedge \sim Q \wedge R)$ ✓
4 → $(P \wedge \sim Q \wedge \sim R)$ ✓

19. For each of the tables in 18–21, construct (a) a Boolean expression having the given table

P	Q	R	S
1	1	1	0
1	1	0	1
1	0	1	0

→ $P \wedge Q \wedge \sim R$

$(P \wedge Q \wedge \sim R) \vee (P \wedge \sim Q \wedge R) \vee (\sim P \wedge Q \wedge R)$

having the given table

P	Q	R	S
1	1	1	0
1	1	0	1
1	0	1	0
1	0	0	1
0	1	1	0
0	1	0	1
0	0	1	0
0	0	0	0

$P \wedge Q \wedge \sim R$

$P \wedge \sim Q \wedge \sim R$

$\sim P \wedge Q \wedge \sim R$

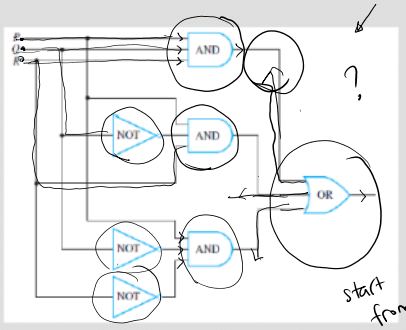
$(P \wedge Q \wedge \sim R) \vee (P \wedge \sim Q \wedge \sim R) \vee (\sim P \wedge Q \wedge \sim R)$

Finding a Circuit That Corresponds to a Given Boolean Expression

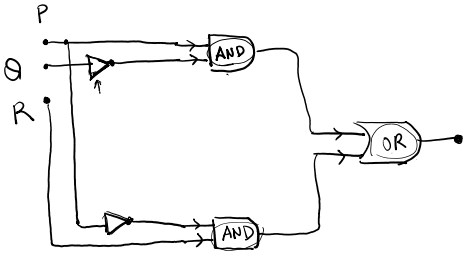
! From outer to the inner; from right to left

$(P \wedge Q \wedge R) \vee (P \wedge \sim Q \wedge R) \vee (P \wedge \sim Q \wedge \sim R)$

AND



17. $(P \wedge \sim Q) \vee (\sim P \wedge R)$



(b) Draw a circuit
having the given table as its input/output table.

19.

P	Q	R	S
1	1	1	0
1	1	0	1
1	0	1	0
1	0	0	1
0	1	1	0
0	1	0	1
0	0	1	0
0	0	0	0

black box

a) $(P \wedge Q \wedge \sim R) \vee (P \wedge \sim Q \wedge \sim R) \vee (\sim P \wedge Q \wedge \sim R)$

b)