8-Nov-2022

Logic Gates

Gate.

A device that perform a basic operation on electrical signals.

Circuits.

Gates combine to perform more complicated task.

Boolean expressions

Use bodean algebra, a mathiametical notation for expressing two value logic.

Logic diagrams

A graphical representation of a circuit each gate has its own symbol.

Truth Table

A table showing all input value and the associated output values.

Date

GATES

Six type of gate

NOT
AND
OR
XOR
NAND
NOR

We are study three gate.

NOT Gate

A NOT gate accepts one input signal (0 or 1) and return the opposite signal as output.

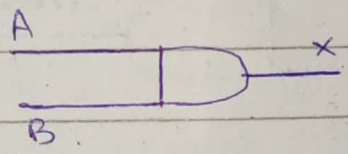
Boolean Expression	Logic Diagram (symbol)	Truth Table	
$X = A'$	A → ▷○ → X	A	X
		0	1
		1	0

RC

Date

AND Gate

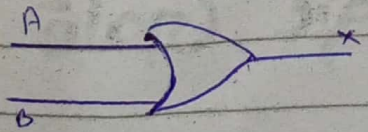
An AND accept two input signals if both are 1, the output is 1; otherwise the output is 0.

Boolean Expression	Logic Diagram symbol	Truth Table
$X = A \cdot B$		

A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate

An OR gate accept two input signals if both are 0, the output is 0; otherwise the output is 1.

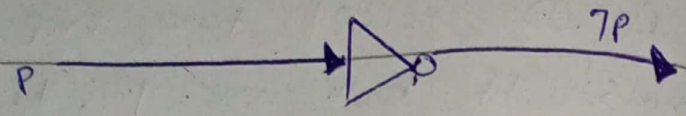
Boolean Expression	logic Diagram symbol	Truth Table
$X = A + B$		

A	B	X
1	1	1
1	0	1
0	1	1
0	0	0

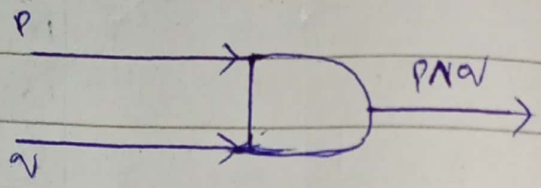
RC

Date

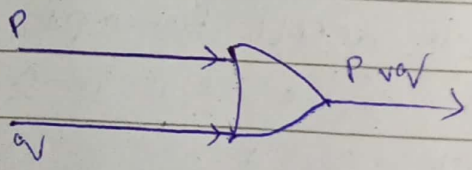
1)



Inverter (NOT)



AND gate



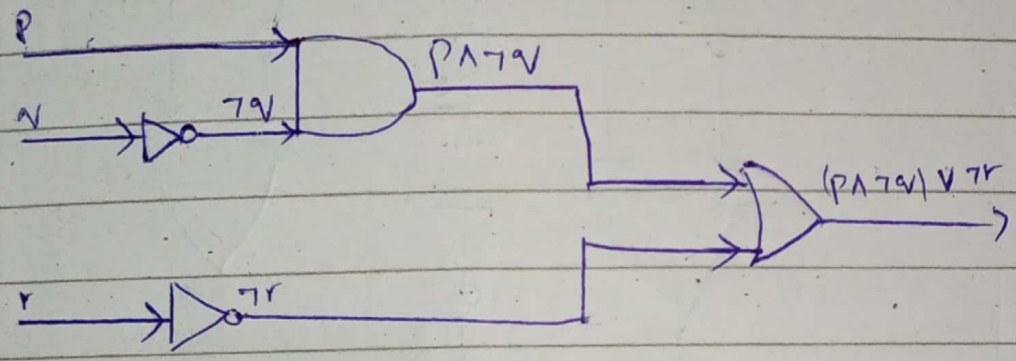
OR gate.

Basic Logic Gates

Date

Basic Logic gates

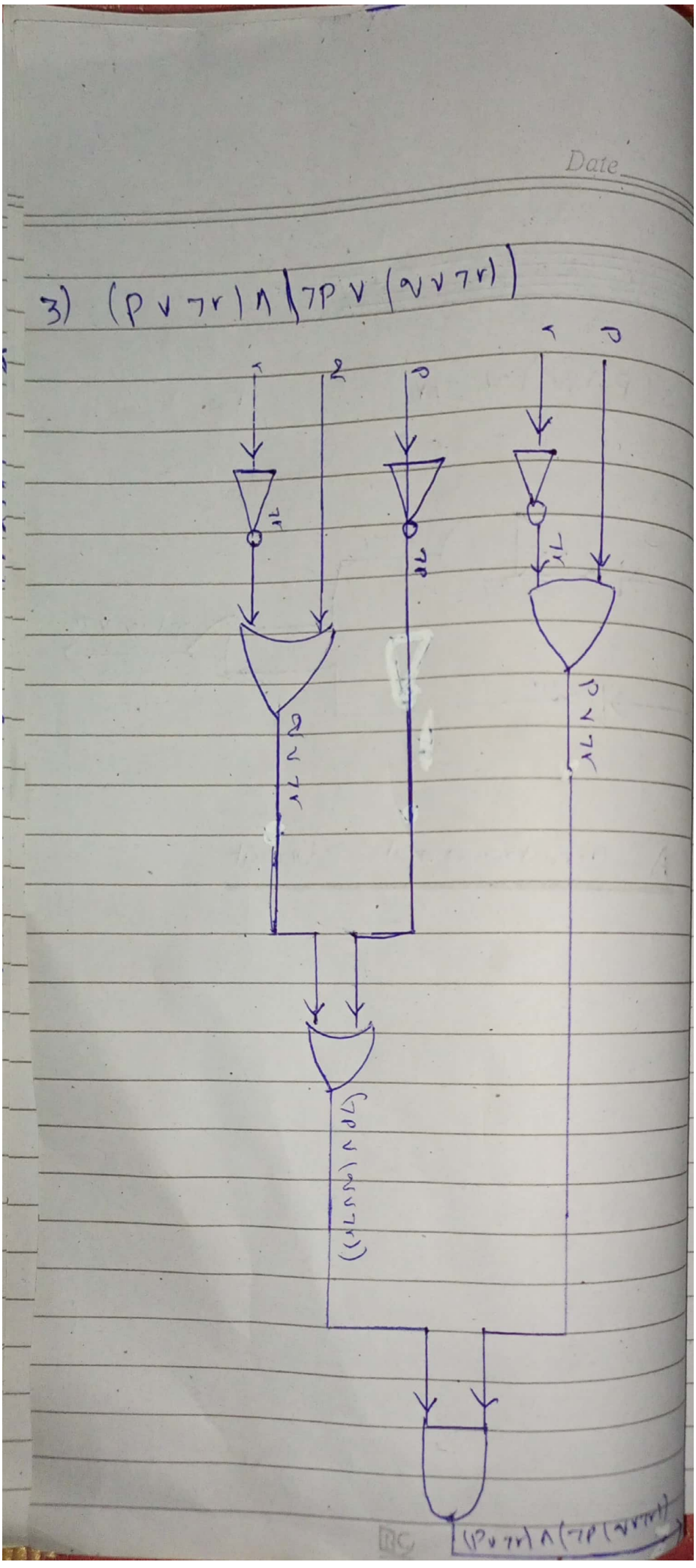
2) $(p \wedge \neg q) \vee \neg r$



A Combinatorial Circuit

Date

3) $(p \vee \neg r) \wedge \neg p \vee (q \vee \neg r)$



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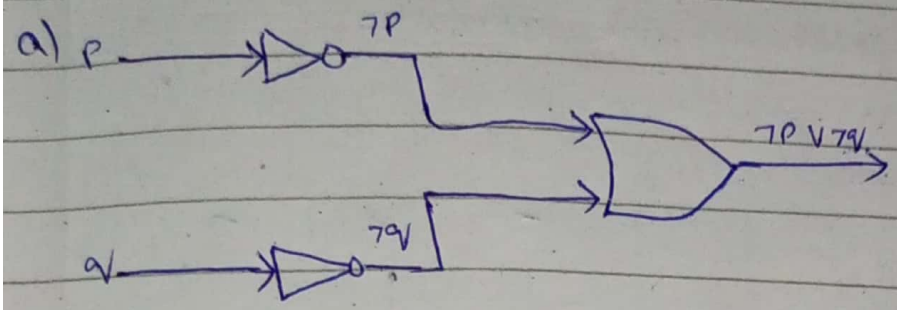
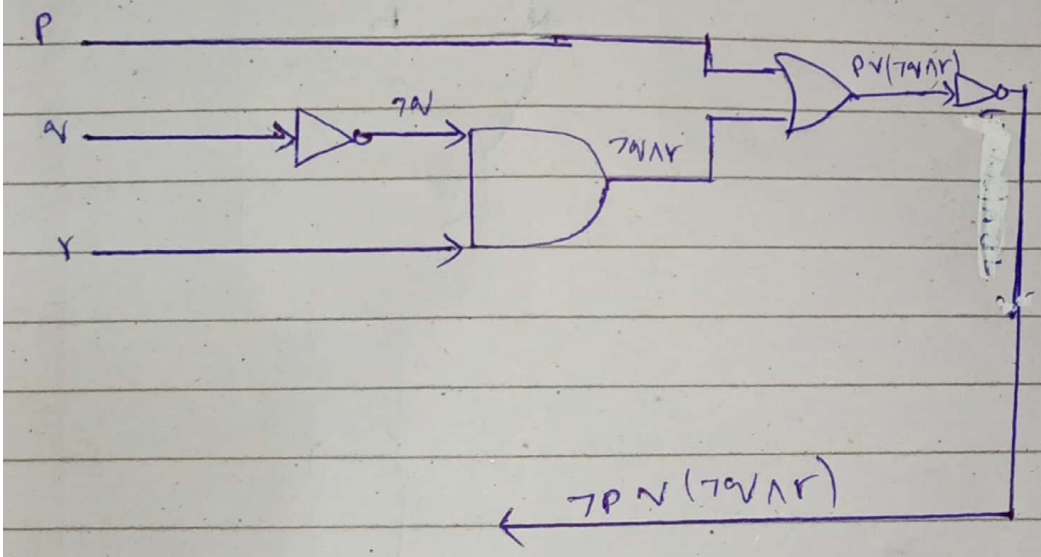
a)



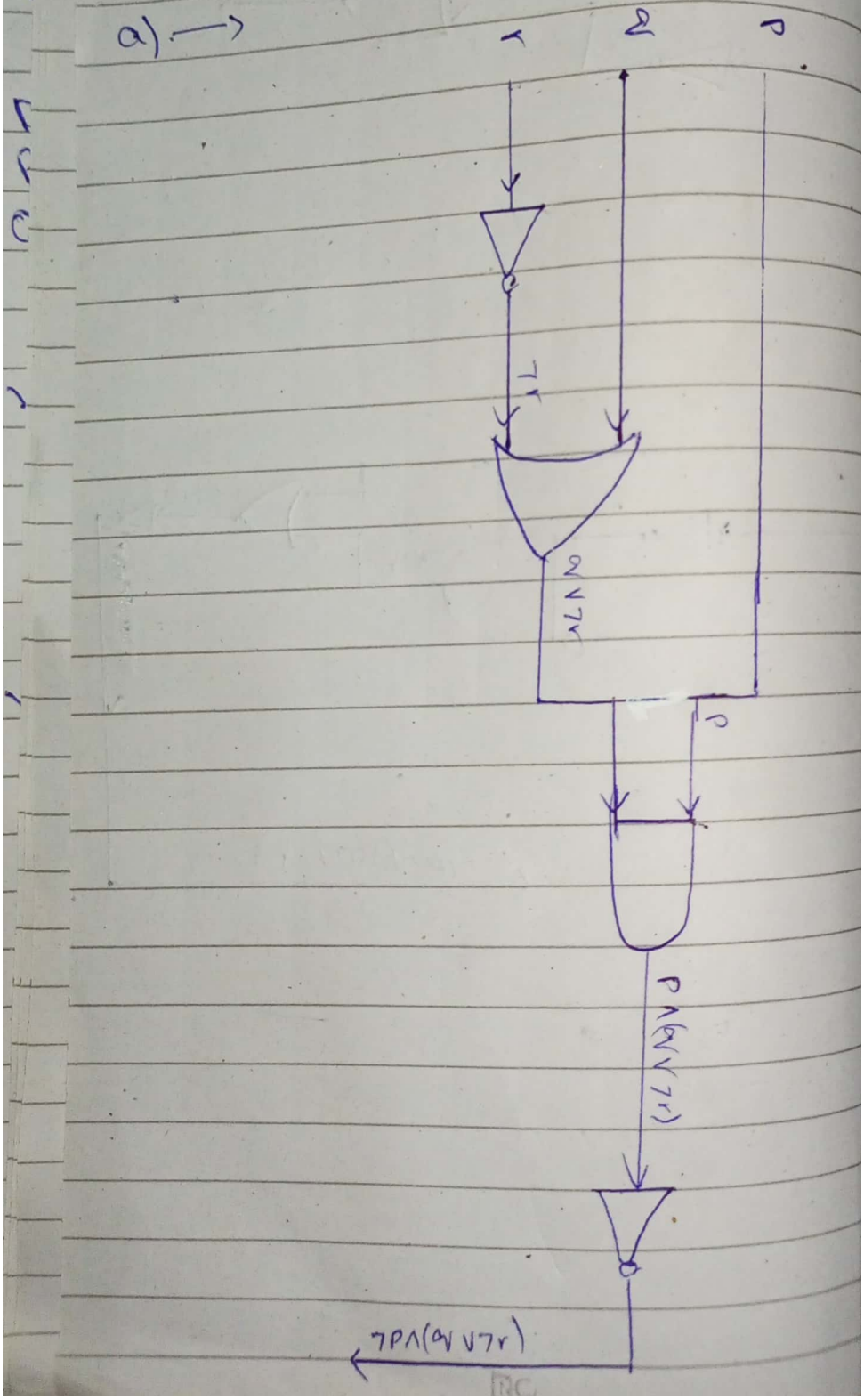
b)



Date

41. Find the output of each of these combinatorial circuits.

a) ⟶

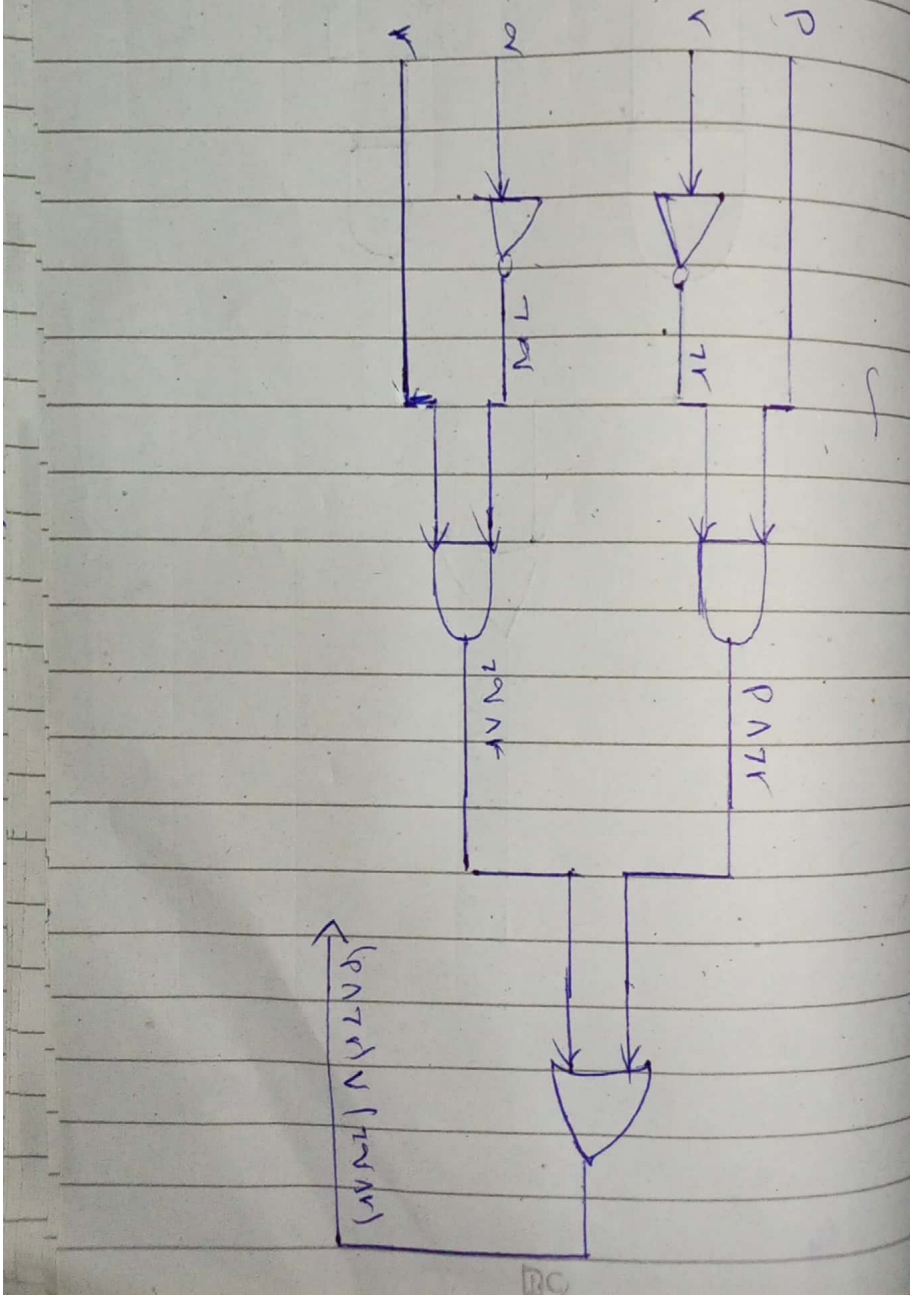


Date

b)

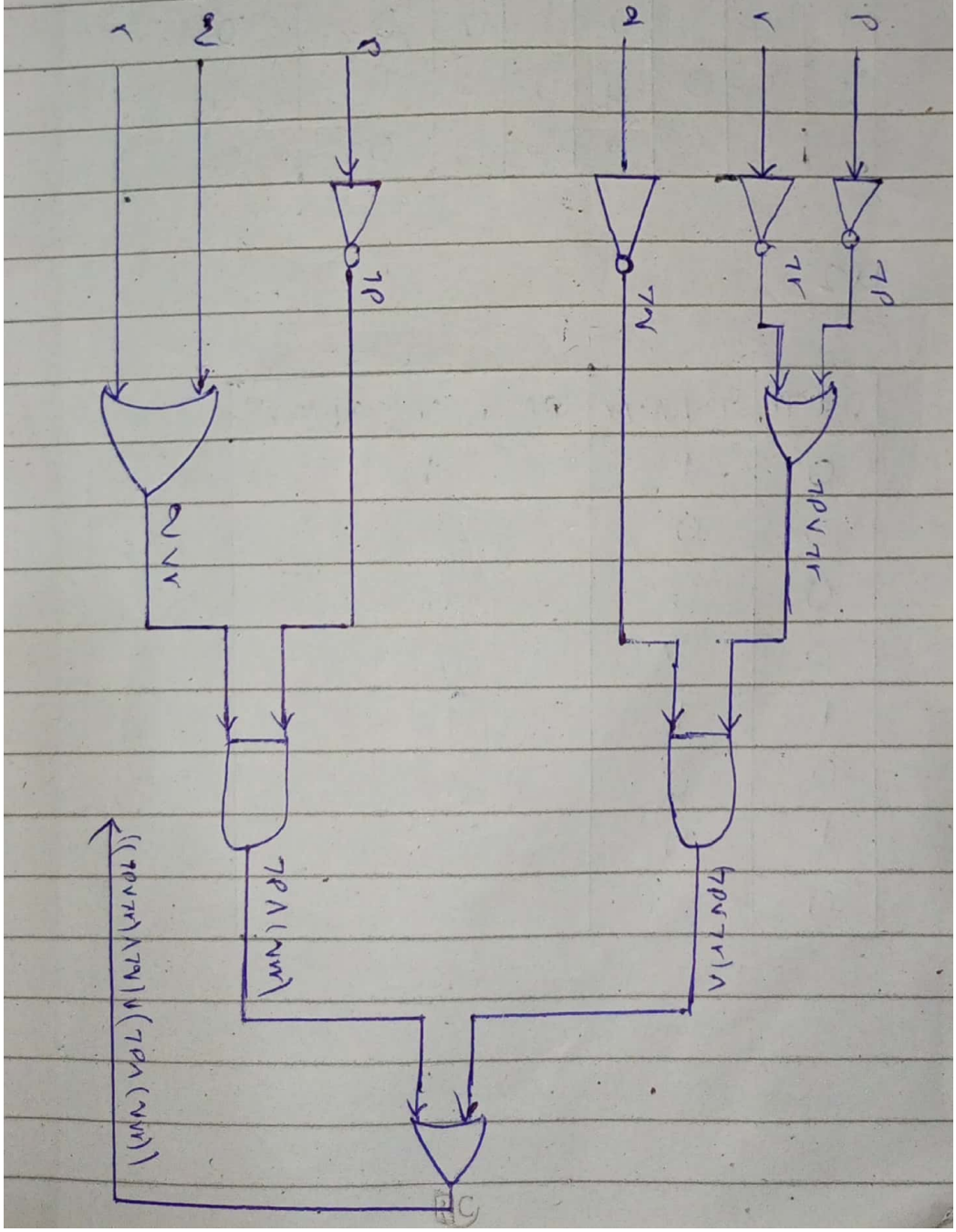
Date

42. Construct a combinational circuit using inverters, OR gates and AND gates that produces the output $(P \wedge \neg r) \vee (\neg q \wedge r)$ from input bits P, q and r.



Date

43. Construct a combinational circuit using inverter, OR gates and AND gates that produce the output $((\neg p \vee \neg r) \wedge \neg q) \vee (\neg p \wedge (q \vee r))$ from input bits p, q and r.



Date

43

p	q	r	$\neg p$	$\neg q$	$p \wedge q$	$(p \wedge q) \wedge r$	$\neg p \vee (p \wedge q) \wedge r$
0	0	0	1	1	0	0	1
0	0	1	1	1	0	0	1
0	1	0	1	0	0	0	1
0	1	1	1	0	0	0	1
1	0	0	0	1	0	0	0
1	0	1	0	1	0	0	0
1	1	0	0	0	1	0	0
1	1	1	0	0	1	1	1

42

$p \vee q$	$p \vee \neg q$	$(p \vee \neg q) \wedge (p \vee q)$
0	1	0
0	0	0
0	0	0
0	0	0
1	1	1
0	0	0
1	0	0
0	0	0

Date

$p \wedge q$	$(p \wedge q) \vee r$	$(\neg p \vee r) \wedge ((p \vee q) \wedge (p \wedge r))$
0	0	1
1	1	1
1	1	1
1	1	1
0	0	1
1	0	0
1	0	0
1	0	0