

①

P	$P \vee P$
1	1
0	0

$P \rightarrow P$  (Diagram: A line labeled P enters a box, and another line labeled P enters the same box from below. The output of the box is a line labeled P.

②

P	$P \wedge P$
1	1
0	0

$P \vee P = P$

③

P	0	$P \vee 0$
1	0	1
0	0	0

P	1	$P \vee 1$
1	1	1
0	1	1

④

P	1	$P \wedge 1$
1	1	1
0	1	0

P	0	$P \wedge 0$
1	0	0
0	0	0

⑤

P	$\neg P$	$P \vee \neg P$
1	0	1
0	1	1

P	$\neg P$	$P \wedge \neg P$
1	0	0
0	1	0

⑥

P	q	r	$P \vee q$	$(P \vee q) \vee r$	$q \vee r$	$P \vee (q \vee r)$
1	1	1	1	1	1	1
1	1	0	1	1	1	1
1	0	1	1	1	1	1
1	0	0	1	1	0	1
0	1	1	1	1	1	1
0	1	0	1	1	1	1
0	0	1	0	1	1	1

④

$P$	$\neg P$	$\neg \neg P$
1	0	1
0	1	0
—		—

⑤

$P$	$Q$	$R$	$P \wedge Q$	$(P \wedge Q) \wedge R$	$Q \wedge R$	$P \wedge (Q \wedge R)$
1	1	1	1	1	1	1
1	1	0	1	0	0	0
1	0	1	0	0	0	0
1	0	0	0	0	0	0
0	1	1	0	0	1	0
0	1	0	0	0	0	0
0	0	1	0	0	0	0
0	0	0	0	0	0	0
			—			—

⑥

$P$	$Q$	$P \vee Q$	$Q \vee P$
1	1	1	1
1	0	1	1
0	1	1	1
0	0	0	0

⑦

$P$	$Q$	$P \wedge Q$	$Q \wedge P$
1	1	1	1
1	0	0	0
0	1	0	0
0	0	0	0
		—	—

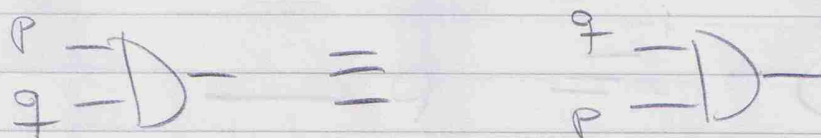
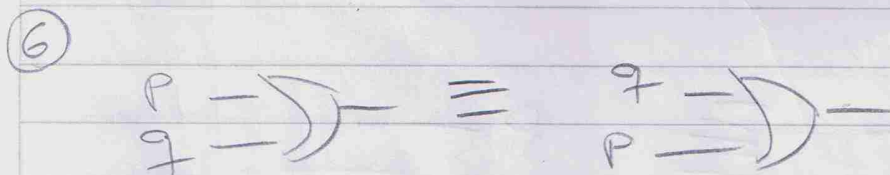
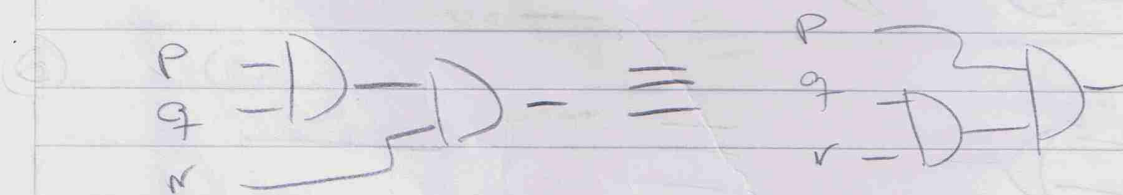
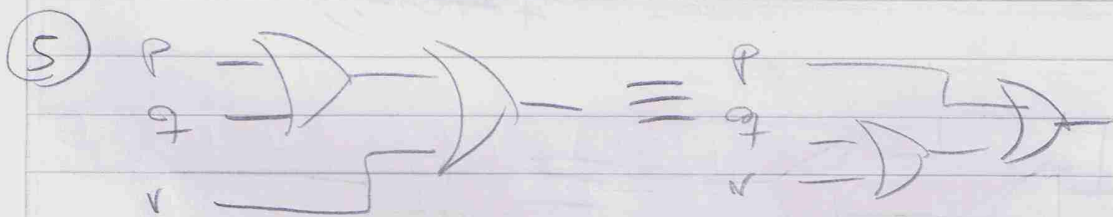
⑦	<u>P</u>	<u>Q</u>	<u>R</u>	<u><math>Q \wedge R</math></u>	<u><math>P \vee Q</math></u>	<u><math>P \vee R</math></u>	<u><math>P \vee (Q \wedge R)</math></u>	<u><math>(P \vee Q) \wedge (P \vee R)</math></u>
	1	1	1	1	1	1	1	1
	1	1	0	0	1	1	1	1
	1	0	1	0	1	1	1	1
	1	0	0	0	1	1	1	1
	0	1	1	1	1	1	1	1
	0	1	0	0	1	0	0	0
	0	0	1	0	0	1	0	0
	0	0	0	0	0	0	0	0
							—	—

⑧	<u>P</u>	<u>Q</u>	<u><math>\neg P</math></u>	<u><math>\neg Q</math></u>	<u><math>P \vee Q</math></u>	<u><math>\neg(P \vee Q)</math></u>	<u><math>\neg P \wedge \neg Q</math></u>
	1	1	0	0	1	0	0
	1	0	0	1	1	0	0
	0	1	1	0	1	0	0
	0	0	1	1	0	1	1
					—	—	—

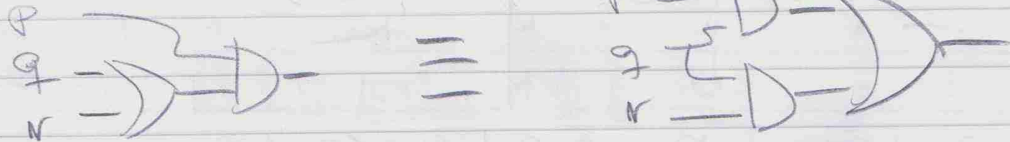
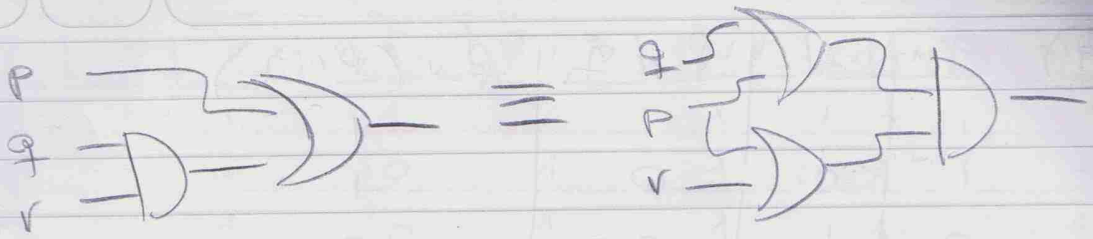
⑧	<u>P</u>	<u>Q</u>	<u><math>\neg P</math></u>	<u><math>\neg Q</math></u>	<u><math>P \wedge Q</math></u>	<u><math>\neg(P \wedge Q)</math></u>
	1	1	0	0	1	0
	1	0	0	1	0	1
	0	1	1	0	0	1
	0	0	1	1	0	1

④	P	Q	$P \wedge Q$	$P \vee (P \wedge Q)$
	1	1	1	1
	1	0	0	1
	0	1	0	0
	0	0	0	0
	1			1

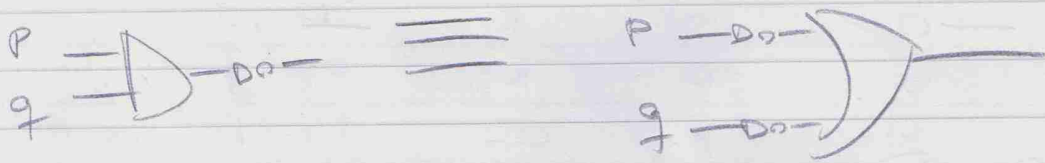
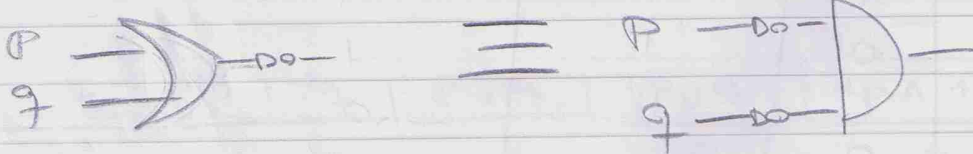
⑤	P	Q	$P \vee Q$	$P \wedge (P \vee Q)$
	1	1	1	1
	1	0	1	1
	0	1	1	0
	0	0	0	0
	1			1



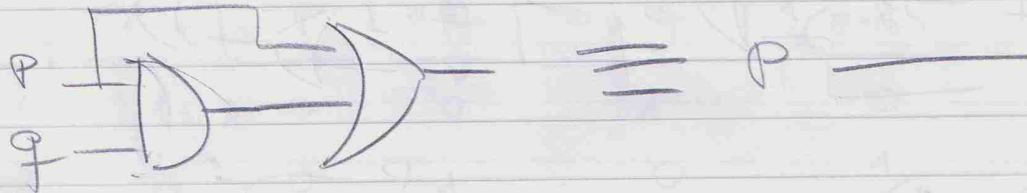
⑦



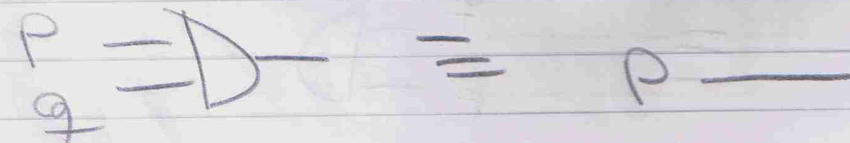
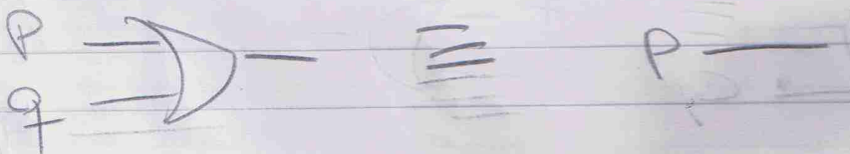
⑧



⑨



⑩





$$\textcircled{2} \quad P \Rightarrow \bigvee \equiv P \mid P \Rightarrow \bigwedge \equiv P$$

$$P \Rightarrow \bigvee \equiv \text{---} \mid P \Rightarrow \bigwedge \equiv \text{---}$$

$$\textcircled{3} \quad P \begin{array}{c} \text{---} \\ \text{---} \end{array} \bigvee \equiv \text{---}$$

$$P \begin{array}{c} \text{---} \\ \text{---} \end{array} \bigwedge \equiv \text{---}$$

$$\textcircled{4} \quad \textcircled{1} \quad P \begin{array}{c} \text{---} \text{DO---} \\ \text{---} \text{DO---} \end{array} \equiv P \text{---}$$

$$\textcircled{2} \quad P \text{---} \text{DO---} \text{DO---}$$