

**Solution.**

(8) We using truth table to prove  $\sim (p \wedge q) \equiv \sim p \vee \sim q$ .

p	q	$\sim p$	$\sim q$	$p \wedge q$	$\sim (p \wedge q)$	$\sim p \vee \sim q$
T	T	F	F	T	F	F
T	F	F	T	F	T	T
F	T	T	F	F	T	T
F	F	T	T	F	T	T

(14) We using truth table to prove  $(p \rightarrow q) \wedge (q \rightarrow p) \equiv (p \leftrightarrow q)$ .

p	q	$p \rightarrow q$	$q \rightarrow p$	$p \rightarrow q \wedge q \rightarrow p$	$p \leftrightarrow q$
T	T	T	T	T	T
T	F	F	T	F	F
F	T	T	F	F	F
F	F	T	T	T	T

(15)  $p \underline{\vee} q \equiv (p \vee q) \wedge \sim (p \wedge q)$ .

p	q	$p \vee q$	$p \wedge q$	$\sim (p \wedge q)$	$p \underline{\vee} q$	$(p \vee q) \wedge \sim (p \wedge q)$
T	T	T	T	F	F	F
T	F	T	F	T	T	T
F	T	T	F	T	T	T
F	F	F	F	T	F	F