Ex 1

p	q	$p \Rightarrow q$
0	0	1
0	1	1
1	0	0
1	1	1

b) c) d) a)

~~a) b)~~ c

Ex 1)

p	q	$p \Rightarrow q$	$\neg p \vee q$	$q \Rightarrow p$	$\neg q \Rightarrow \neg p$	$p \wedge q$
0	0	1				
0	1	1				
1	0	0	0	1	0	0
1	1	1				

This is here $(p \Rightarrow q) \Rightarrow F(0)$

Ex 2)

a) if the Δ is equilater (q), then the Δ is isosceles too (p)

b) if the Δ is NOT isosceles ($\bar{p}$), then the Δ is not equilateral too ($\bar{q}$)

c) if the Δ is equilateral (q), it is also equiangular (r)

d) the Δ is isosceles (p) and not equilateral ($\bar{q}$)

e) if the Δ is equiangular (r), then the Δ is equilateral too (p)

Scanned with CamScanner

Ex 3) a)

p	q	$\bar{p}$	$\bar{q}$	$p \wedge \bar{q}$	$\neg(p \wedge \neg q)$	$\neg(p \wedge \bar{q}) \Rightarrow \neg p$
0	0	1	1	0	1	1
0	1	1	0	0	1	1
1	0	0	1	1	0	1
1	1	0	0	0	1	0

b)

p	q	r	$q \Rightarrow r$	$p \Rightarrow (q \Rightarrow r)$
0	0	0	1	0
0	0	1	0	1
0	1	0	1	1
0	1	1	1	1
1	0	0	1	1
1	0	1	0	0
1	1	0	1	1
1	1	1	1	1

Ex | 4

a)

q	$\neg q$	$\bar{p}$	$\neg p \vee \neg q$	$q \Leftrightarrow (\neg p \vee \neg q)$
0	1	0	1	0
0	1	1	1	0
1	0	0	0	0
1	0	1	1	1

not a tautology

b)

p	q	r	$p \Rightarrow q$	$q \Rightarrow r$		$p \Rightarrow r$	$[(p \Rightarrow q) \wedge (q \Rightarrow r)] \Rightarrow (p \Rightarrow r)$
0	0	1	1	1	1	0	
0	1	0	1	0	0	1	
0	1	1	0	1	1	1	
1	0	0	0	1	1	0	
1	0	1	0	0	1	1	
1	1	0	1		0	0	
1	1	1	1	1		1	
0	0	0	1	1		1	

p	q	r	$p \Rightarrow q$	$q \Rightarrow r$	$(p \Rightarrow q \vee q \Rightarrow r$	$p \Rightarrow r$	$[(p \Rightarrow q) \vee (q \Rightarrow r)] \Rightarrow (p \Rightarrow r)$
0	0	0	1	1	1	1	1
0	0	1	1	1	1	1	1
0	1	0	1	0	1	1	1
0	1	1	1	1	1	1	1
1	0	0	0	1	1	0	0
1	0	1	0	1	1	1	1
1	1	0	1	0	1	0	0
1	1	1	1	1	1	1	1

not a tautology

Ex 5

q	$\neg p$	r	s	$\neg p \vee r$	$(\neg p \vee r) \wedge \neg s$	$q \Rightarrow ((\neg p \vee r) \wedge \neg s)$	$\neg r \vee q$	$\neg r \wedge q$	$\neg s \Rightarrow (\neg r \wedge q)$	$(q \Rightarrow [(\neg p \vee r) \wedge \neg s]) \wedge [\neg s \Rightarrow (\neg r \wedge q)]$
0	0	0	0	0	0	1	1	0	0	0
0	0	0	1	1	0	1	1	0	1	1
0	0	1	0	0	0	1	0	0	0	0
0	0	1	1	1	0	1	0	0	1	1
0	1	0	0	1	1	1	1	0	0	0
0	1	0	1	1	0	1	1	0	1	1
0	1	1	0	1	1	1	0	0	0	0
0	1	1	1	1	0	1	0	0	1	1
1	0	0	0	0	0	0	1	1	1	0
1	0	0	1	1	0	0	1	1	1	0
1	0	1	0	0	0	0	1	0	0	0
1	0	1	1	1	0	0	1	0	1	0
1	1	0	0	1	1	1	1	1	1	1
1	1	0	1	1	0	0	1	1	1	0
1	1	1	0	1	1	1	1	0	0	0
1	1	1	1	1	0	0	1	0	1	1

E26

a)

p	q	r	$q \wedge r$	$p \Rightarrow (q \wedge r)$	$p \Rightarrow q$	$p \Rightarrow r$	$(p \Rightarrow q) \wedge (p \Rightarrow r)$	$[p \Rightarrow (q \wedge r)] \equiv [(p \Rightarrow q) \wedge (p \Rightarrow r)]$
0	0	0	0	1	1	1	1	1
0	0	1	0	1	1	1	1	1
0	1	0	0	1	1	1	1	1
0	1	1	1	1	1	1	1	1
1	0	0	0	0	0	0	0	1
1	0	1	0	0	0	1	0	1
1	1	0	0	0	1	0	0	1
1	1	1	1	1	1	1	1	1

$[p \Rightarrow (q \wedge r)] \Leftrightarrow [(p \Rightarrow q) \wedge (p \Rightarrow r)]$

for all ~~outcome~~ outcomes

b)

T_8

p	q	r	$q \vee r$	$p \Rightarrow (q \vee r)$ (S)	$p \Rightarrow q$	$\neg r \Rightarrow (p \Rightarrow (q))$ (T)
0	0	0	0	1	1	1
0	0	1	1	1	1	1
0	1	0	1	1	1	1
0	1	1	1	1	1	1
1	0	0	0	0	0	0
1	0	1	1	1	0	1
1	1	0	1	1	1	1
1	1	1	1	1	1	1

$S \equiv T$

$S \Leftrightarrow T$ for all ~~outcome~~ outcomes

Scanned with CamScanner

Ex 7 a)

$\cancel{\neg((p \land q) \Rightarrow r)}$

$(\neg p \land \neg q) \Rightarrow \neg r$ $\qquad (\neg t \land \neg s) \equiv \neg(t \lor s)$

$\Downarrow$

$\neg(p \lor q) \Rightarrow \neg r$ $\qquad (s \Rightarrow t \equiv \neg t \Rightarrow \neg s)$

$\Downarrow$

$r \Rightarrow (p \lor r)$

b) $p \Rightarrow (\neg q \land r)$

$\neg p \Rightarrow (q \land \neg r)$

$\neg(q \land \neg r) \Rightarrow p$

$(\neg q \lor r) \Rightarrow p$

Ex 8 a)

$\alpha = p$
$\beta = q$
$\gamma = r$

$(p \lor q) \lor r \equiv p \lor (q \lor r)$

b) $(p \land q) \land r \equiv [p \land (q \land r)]$

p	q	r	$p \lor q$	$(p \lor q) \lor r$	$q \lor r$	$p \lor (q \lor r)$	$p \land q$	$(p \land q) \land r$	$q \land r$	$p \land (q \land r)$
0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	1	1	1	0	0	0	0
0	1	0	1	1	1	1	0	0	0	0
0	1	1	1	1	1	1	0	0	1	0
1	0	0	1	1	0	1	0	0	0	0
1	0	1	1	1	1	1	0	0	0	0
1	1	0	1	1	1	1	1	0	0	0
1	1	1	1	1	1	1	1	1	1	1

~~Sm outcome~~
Same outcome

Same outcome

9

1)

$p \Rightarrow (p \vee q)$ b) $\neg(p \Rightarrow (p \vee q))$ c)

p	q	$p \vee q$	$p \Rightarrow (p \vee q)$	$\neg(p \Rightarrow (p \vee q))$	$p \Rightarrow (p \Rightarrow q)$	$p \Rightarrow q$
0	0	0	1	0	0	1
0	1	1	0	1	1	0
1	0	1	1	0	1	1
1	1	1	1	0	1	1
			Satisfiable	Satisfiable	Statisfiable	

10 a) $\neg p \Rightarrow (q \Rightarrow r)$