ICE-7

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1)Negation: ¬p

p	~p
True	False
False	True

2) Conjunction: p ∧ q

P	Q	P^Q
True	True	True
True	False	False
False	True	False
False	False	False

3) Disjunction: p ∨ q

P	Q	p ∨ q
True	True	True
True	False	True
False	True	True
False	False	False

4) Implication: p ⟹ q

P	Q	p ⟹ q
True	True	True
True	False	False
False	True	True
False	False	True

5) Bi-Implication: p ⟺ q

P	Q	p ⟺ q
True	True	True
True	False	True
False	True	False
False	False	True

6) Contradiction: p∧¬p

P	Q	p∧¬p
True	False	False
False	True	False

7) Compound Propositions: (20%)

a. (p ∧ q) ∨ ¬q

P	Q	p ∧ q) ∨ ¬q
True	True	True
True	False	True
False	True	False
False	False	True

b. p∨¬q) ∧ ¬p

P	Q	(p∨¬q) ∧ ¬p
True	True	False
True	False	False
False	True	False
False	False	True

c. ¬ (p → q) and p ∧ ¬q

p	q	r	(p ∧ q) → (p ∧ r)
0	0	0	True
0	0	1	True
0	1	0	True
0	1	1	True
1	0	0	True
1	0	1	True
1	1	0	False
1	1	1	True

8) Among these given compound propositions equivalent? Show the truth table output side by side for each statement

a. (p ∧ q) → r and P → (q ∧ r)

p	q	r	(p ∧ q) → r	P → (q ∧ r)
0	0	0	1	1
0	0	1	1	1
0	1	0	1	1
0	1	1	1	1
1	0	0	1	0
1	0	1	1	0
1	1	0	0	0
1	1	1	1	1

expressions not are eqivalent

b. (p → q) ∧ (q → p) and p ↔ q

p	q	(p → q)∧(q → p)	p ↔ q
0	0	1	1
0	1	0	0
1	0	0	0
1	1	1	1

expressions are eqivalent

c. ¬ (p → q) and p ∧ ¬q

p	q	¬ (p → q)	p ∧ ¬q
0	0	1	1
0	1	0	0
1	0	0	0
1	1	1	1

expressions are eqivalent

d. (p → q) ∧ (p → r) and p→ (q ∧ r)

p	q	r	(p → q)∧(p → r)	p→ (q ∧ r)
0	0	0	1	1
0	0	1	1	1
0	1	0	1	1
0	1	1	1	1
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

expressions are eqivalent

9) Tautology:

Tautology means all have the same 1 or true as input

a. p∨¬p

p	p v ~p
False	True
True	True

b. b. ~ (a ∧ b) ↔ (~a ∨ ~b)

a	b	~(a ∧ b)↔(~a ∨ ~b)
False	False	1
False	True	1
True	False	1
True	True	1

c. (((a ∨ b) ∧ (a → c)) ∧ (b → c)) → c

a	b	c	(((a v b) ^ (a -> c)) ^ (b -> c)) -> c
False	False	False	True
False	False	True	True
False	True	False	True
False	True	True	True
True	False	False	True
True	False	True	True
True	True	False	True
True	True	True	True

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