CSE 103
DISCRETE MATHEMATICS

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Chapter : 1 , Section : 1

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Question :

33. Construct a truth table for each of these compound propositions.
a) $(p \lor q) \to (p \oplus q)$ **b)** $(p \oplus q) \to (p \land q)$

c) $(p \lor q) \oplus (p \land q)$ **d)** $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow q)$

e) $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow \neg r)$

f) $(p \oplus q) \to (p \oplus \neg q)$

Answer:

To construct the truth table for a compound proposition, we work from the inside out. In each case, we will
show the intermediate steps. In part (a), for example, we first construct the truth table for $p \lor$
q, then the
truth table for p EB q, and finally combine them to get the truth table for $(p \lor q)$ -+ $(p$ EB $q)$. For parts (a),
(b), and (c) we have the following table (column five for part (a), column seven for part (b), column eight
for part (c)).
p q pVq pEB q (pV q) -+ (p EB q) p /\ q (p EB q) -+ (p /\ q) (pV q) EB (p/\ q)
T T T F F T T F
T F T T T F F T
F T T T T F F T
F F F F T F T F
For part (d) we have the following table.
p q 'P p f--7 q •P ,_. q (p ,_. q) EB (•P ,_. q)

T T F T F T
T F F F T T
F T T F T T
F F T T F T
For part (e) we need eight rows in our truth table, because we have three variables.
p q r 'P •r p f--7 q •P ,_. •r (p ,_. q) EB (•p ,_. •r)
T T T F F T T F
T T F F T T F T
T F T F F F T T
T F F F T F F F
F T T T F F F F
F T F T T F T T
F F T T F T F T
F F F T T T T F

For part (f) we have the following table.

p	q	•q	p EB q	p EB •q	(p EB q) -+ (p EB •q)
T	T	F	F	T	T
T	F	T	T	F	F
F	T	F	T	F	F
F	F	T	F	T	T