

Discrete Structures-2025: Tutorial-1

Propositional Logic

(1) Let p and q be two propositions “Swimming at the New Jersey shore is allowed” and “Sharks have been spotted near the shore”, respectively. Express each of these compound propositions as an English sentence.

(i) $\neg q$

(ii) $p \wedge q$

(iii) $\neg p \vee q$

(iv) $\neg q \implies p$

(v) $p \rightarrow \neg q$

(vi) $p \leftrightarrow \neg q$

(vii) $\neg p \wedge (p \vee \neg q)$

(2) Let p and q be the propositions.

p : You drive over 120 kilometers per hour. q : You get a speeding ticket.

Write these following propositions using p and q and logical connectives.

(a) You do not drive over 120 kilometers per hour.

(b) You drive over 120 kilometers per hour, but you do not get a speeding ticket.

(c) You will get a speeding ticket if you drive over 120 kilometers per our.

(d) If you do not drive over 129 kilometers per our, then you will not get a speeding ticket.

(e) Driving over 120 kilometers per hour is sufficient for getting a speeding ticket.

(f) You get a speeding ticket, but you do not drive over 120 kilometers per hour.

(3) Construct a truth table for each of these compound propositions.

(i) $p \oplus p$

(ii) $p \oplus \neg p$

(iii) $p \oplus \neg q$

(iv) $p \rightarrow \neg q$

(v) $(p \rightarrow q)(\neg p \rightarrow q)$

(vi) $(p \leftrightarrow q) \vee (\neg q \leftrightarrow q)$

(vii) $p \rightarrow (\neg q \vee r)$

(viii) $(p \rightarrow q) \vee (\neg p \rightarrow r)$

(ix) $(p \rightarrow q) \wedge (\neg p \rightarrow r)$

(x) $(p \leftrightarrow q) \vee (\neg q \leftrightarrow r)$