Course Code : MATH2007

Course Name: Discrete Mathematics

Tautology,Contradiction, Satisfiability, Equivalence By Dr. Varsha Gautam Galgotias University, Greater Noida(U.P.)

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Course Code : MATH2007

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In this presentation we will discuss following things:

- Tautology and Contradiction
- Satisfiability
- > Equivalence

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Tautology and Contradiction

A tautology is a compound proposition that is **true** no matter what the truth values of its atomic propositions are! $Ex. p \lor \neg p$ [What is its truth table?] A contradiction is a compound proposition that is **false** no matter what! $Ex. p \land \neg p$ [Truth table?] Other compound props. are contingencies.

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Satisfiability

A compound proposition is *satisfiable* if it is true for at least one interpretation. A statement is *unsatisfiable* if it is false for every interpretation. Note: A tautology and contradiction are satisfiable.

A contradiction is unsatisfiable.

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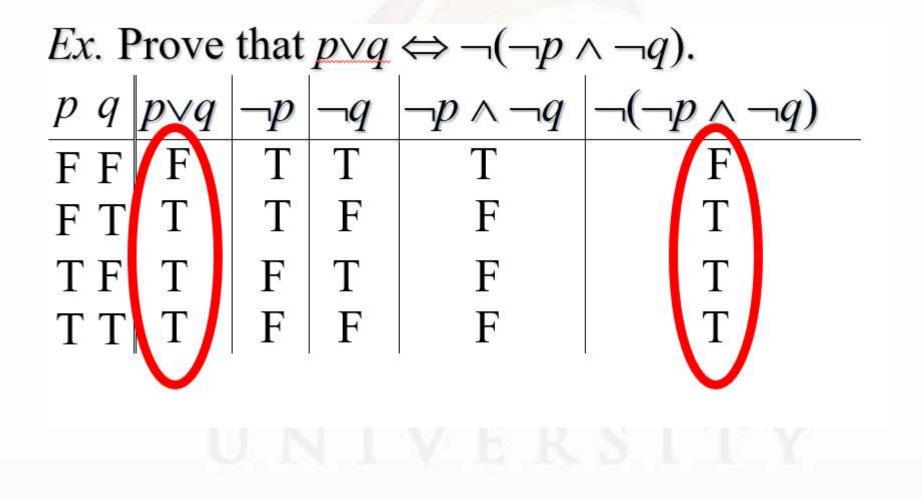
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The compound propositions p and q are called *logically* equivalent if $p \leftrightarrow q$ is a tautology. The notation $p \equiv q$ denotes that p and q are logically equivalent. Compound propositions that have the same truth values in all possible cases are called logically equivalent. Example: Show that $\neg p \lor q$ and $p \rightarrow q$ are logically equivalent.



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Assignment

- 1. Show that $(p \to q) \land (q \to r) \to (p \to r)$ is a **tautology.**
- 2. Show that $(p \rightarrow q) \rightarrow r$ and $p \rightarrow (q \rightarrow r)$ are not logically equivalent.

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Video link: https://www.youtube.com/watch?v=Ji2vr-9duPI&list=PLHXZ9OQGMqxersk8fUxiUMSIx0DBqsKZS&index=14 References: Discrete Mathematics and its application by Kenneth H Rosen

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Thank you!!!!!

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