LECTURE-08 Sub- Mathematics-II

BCA Ist year (II Sem)

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UNIT-IV TOPIC- LATTICES

* Conditional statement OR If Part OR Necessary Condition OR Then →

Let P and q be two statements. Then P Conditional q is denoted by $P \Rightarrow q$ OR $P \rightarrow q$ OR P then q and defind as

If P is true and q is false Then $P \rightarrow q$ is false otherwise true

Truth table for $P \rightarrow q$:-

P	q	$P \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

* BiConditional Statement →

Let P and q be two statements. Then P biconditional q is denoted by $P \Leftrightarrow q$ OR $P \leftrightarrow q$ and defind as

If P and q both have same value Then $P \leftrightarrow q$ is true otherwise false.

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Truth table for $P \leftrightarrow q$ →

P	q	$P \leftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T

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* Tautology and Contraduction →

A statement which is true for all Possible value then it is said to be tautology.

A statement which is always false for all Possible Value Then it is Called Contraduction. with Example.

Example Show that $[P \wedge (P \rightarrow q)] \rightarrow q$ is Tautology.

Solⁿ

P	q	$P \rightarrow q$	$P \wedge (P \rightarrow q)$	$[P \wedge (P \rightarrow q)] \rightarrow q$
T	T	T	T	T
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

Since $[P \wedge (P \rightarrow q)] \rightarrow q$ Contains only T Then it is tautology.

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Equivalent statements OR functions →

Two statements p and q are said to be logically equivalent if they have same or identical truth value. It is denoted by '='.

Example Prove that $p \to q = \sim p \vee q$

Solⁿ

p	q	$p \to q$	$-p$	$-p \vee q$
T	T	T	F	T
T	F	F	F	F
F	T	T	T	T
F	F	T	T	T

We observed that the truth values of $p \to q$ and $-p \vee q$ are identical. Then $p \to q = -p \vee q$ so these are equivalent statement.

Imp

* Law of Duality →

The duality is obtained by changing $\vee$ and $\wedge$ i-e

$(p \vee q) \wedge r$ Then its dual is $(p \wedge q) \vee r$

* Connectives → ($\downarrow$ and $\uparrow$) →

There are two another connectivites is Called "NAND" and "NOR" Then NAND is denoted by $\uparrow$ and NOR is denoted by $\downarrow$. and defind as

If p and q are two statements

Then $p \uparrow q = -(p \wedge q)$

and $p \downarrow q = -(p \vee q)$

Truth table for 'NAND' and 'NOR' →

p	q	$p \wedge q$	$p \vee q$	$p \uparrow q = -(p \wedge q)$	$p \downarrow q = -(p \vee q)$
T	T	T	T	F	F
T	F	F	T	T	F
F	T	F	T	T	F
F	F	F	F	T	T

Arguments → An argument is a process by which a conclusion is formed from a given set of statements called premises.

An argument is said to be valid argument iff the conjuction of the premises implies the conclusion. i.e $P_1, P_2, P_3 --- P_n$ is valid iff the statement

$$(P_1 \wedge P_2 \wedge P_3 ---- \wedge P_n) \rightarrow r \text{ (truth)}$$

is tautology.

Example

Prove that the following argument is valid.

$$\left.\begin{array}{l} P \\ P \rightarrow q \end{array}\right\} \text{Premises}$$

$$\overline{\quad q \quad} \rightarrow \text{Conclusion}$$

Soln

The argument is valid iff

$$[P \wedge (P \rightarrow q)] \rightarrow q \quad \text{(true)}$$

OR tautology

P	q	$P \rightarrow q$	$P \wedge (P \rightarrow q)$	$[P \wedge (P \rightarrow q)] \rightarrow q$
T	T	T	T	T
T	F	F	T	T
F	T	T	F	T
F	F	T	F	T
			F	T

Then the statement is valid.