DMS

Logic:

⇒ reason to present argument.

⇒ when we convince someone on our argument, we give reasons. This reason is called logic.

Example

Most of the students get D grade

Logic

Students not study

Teacher don't give grade

Propositional logic:

Statement either true or false

Proposition

⇒ It is declarative statement that has either a truth value "true" or "false".

⇒ It consists of propositional variables and connectives.

Example

Following are the propositions:

⇒ Paris is in France. (True)

⇒ $2<4$ (False)

⇒ $\boxed{2+x=4}$ is not a proposition bcz it has an unknown variable. We are not sure about the ~~ea~~statement either it is true or false.

Fact

⇒ similar to proposition.

⇒ It also returns T/F.

⇒ It vary geographically, religionally or on gender base.

Variables assign to Proposition:

variables used in DMS,

p, q, r, s, ...

This is DMS class ⇒ proposition

- Assigning Variable (:)
  p: This is DMS class
- Negation ($\neg$)
  $\neg p$ = This is not DMS class

Propositional Logic Operator:

Conjuction:

=> Similar to AND operator.
=> denoted by ($\wedge$)
=> 2 propositions are required.
=> If both propositions are true then the whole outcome will true.

Example

p = Today is thursday
q = It is very hot today.

~~p^q~~ $p \wedge q$

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

Truth table

Date: / /　　Day: (M)(T)(W)(T)(F)(S)

ii) Disjunction:

⇒ Similar to OR operator
⇒ denoted by (V)
⇒ two propositions are required.
⇒ If both propositions are false then the outcome will be false. in any other case it will return True.

Example: win cricket

p = makes a century
q = takes 5 wickets

$p \vee q$

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

Truth table

(iii) Implication:

⇒ denoted by $p \Rightarrow q$

⇒ read as "if p then q", p implies q.

⇒ similar to if condition.

⇒ q depends on p either what is the behaviour of q.

⇒ It is false only when p is true and q is false and is true in all other situations.

Example

p: Matric marks 950

q: Nokia Mobile

$p \longrightarrow q$

⇒ It is unidirectional.

p(hypothesis) and q(conclusion)

p	q	$p \to q$
T	T	T
T	F	F
F	T	T
F	F	T

Truth table

(iv) Biimplication

⇒ denoted by ($\longleftrightarrow$)

⇒ bidirectional

⇒ The bi-implication of P and Q is true if and only if both P and Q are true or both P and Q are false.

Example

p = I eat lunch

q = my mood improve.

p	q	$p \leftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	F

Truth table

Additional Operators/Conditions by using basic Operators:

$p \rightarrow q$

Inverse: $\neg p \rightarrow \neg q$

converse: $q \rightarrow p$

contrapositive: $\neg q \rightarrow \neg p$

Tautology:
which always return true value.

which always return false value.

Predicate
⇒ A predicate is a statement that contains variables, sometimes reffered to as predicate variables, and may be ~~ta~~ true or false depending on those variables values

Example

i) $x > 5$ $p(x): x > 5$

ii) $y = x + 5$

$p(x, y): y = x + 5$

(ii) This statement returns false for $x = 2$ and $y = 9$

$P(2,9): 9 = 2 + 5$

But it will returns true for $P(2,7)$.

Logical Equivalence

When the truth-table of two compound propositions are equal.

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

p	q	$p \wedge q$	$\neg(p \wedge q)$	$\neg p$	$\neg q$	$\neg p \vee \neg q$
T	T	T	F	F	F	F
T	F	F	T	F	T	T
F	T	F	T	T	F	T
F	F	F	T	F	T	T

same

Hence proved

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