Notes for Lecture Number 1 & 2

Statements
A statement is a sentence that is either true or false, but not both simultaneously.

Note:
No sentence can be called a statement if

- It is an exclamation.
- It is an order or request.
- It is a question.

Simple Statements
A statement is called simple if it cannot be broken down into two or more statements.

Compound Statements
A compound statement is one which is made up of two or more simple statement.

Connectives
The words which combine or change simple statements to form new statements or compound statements are called connectives.

Conjunction
If two simple statements p and q are connected by the word 'and', then the resulting compound statement "p and q" is called a conjunction of p and q is written in symbolic form as "**p ∧ q**".

Note:

- The statement p ∧ q has the truth value T (true) whenever both p and q have the truth value T.
- The statement p ∧ q has the truth value F (false) whenever either p or q or both have the truth value F.

Disjunction
If two simple statements p and q are connected by the word 'or', then the resulting compound statement "p or q" is called disjunction of p and q and is written in symbolic form as "**p ∨ q**".

Note:

- The statement p ∨ q has the truth value F whenever both p and q have the truth value F.
- The statement p ∨ q has the truth value T whenever either p or q or both have the truth value T.

Negation

An assertion that a statement fails or denial of a statement is called the negation of the statement. The negation of a statement p in symbolic form is written as "~p".

Note:

- ~p has truth value T whenever p has truth value F.
- ~p has truth value F whenever p has truth value T.

Negation of Conjunction

The negation of a conjunction p ∧ q is the disjunction of the negation of p and the negation of q.
Equivalently we write ~ (p ∧ q) = ~p ∨ ~q.

Negation of Disjunction

The negation of a disjunction p ∨ q is the conjunction of negation of p and the negation of q.
Equivalently, we write ~(p ∨ q) = ~p ∧ ~q.

Negation of Negation

Negation of negation of a statement is the statement itself.
Equivalently, we write ~(~p) = p

(i) For all or for every is called universal quantifier.
(ii) There exists is called existential quantifier.