

## 1.6. Method To Construct DNF

To construct DNF of a logical proposition we use the following way.

Construct a truth table for the proposition.

- (i) Use the rows of the truth table where the proposition is True to construct minterms
- If the variable is true, use the propositional variable in the minterm.
  - If a variable is false, use the negation of the variable in the minterm.
- (ii) Connect the minterms with  $\vee$ 's.

**Example 1.6.1.** Find the disjunctive normal form for the following logical proposition

(i)  $p \rightarrow q$ .

(ii)  $(p \rightarrow q) \wedge \sim r$ .

**Solution.** (i) Construct a truth table for  $p \rightarrow q$ :

p	q	$p \rightarrow q$	
T	T	T	←
T	F	F	
F	T	T	←
F	F	T	←

$p \rightarrow q$  is true when either  
 $p$  is true and  $q$  is true, or  
 $p$  is false and  $q$  is true, or  
 $p$  is false and  $q$  is false.

The disjunctive normal form is then

$$(p \wedge q) \vee (\sim p \wedge q) \vee (\sim p \wedge \sim q).$$

(ii) Write out the truth table for  $(p \rightarrow q) \wedge \sim r$

p	q	r	$p \rightarrow q$	$\sim r$	$(p \rightarrow q) \wedge \sim r$	
T	T	T	T	F	F	
T	T	F	T	T	T	←
T	F	T	F	F	F	
T	F	F	F	T	F	
F	T	T	T	F	F	
F	T	F	T	T	T	←
F	F	T	F	F	F	
F	F	F	T	T	T	←