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

d) Exclusive or ($\oplus$) :

Let p and q be the propositions, the exclusive or of p and q is true when exactly one of p and q is true and otherwise false

p	q	$p \oplus q$
T	T	F
T	F	T
F	T	T
F	F	F

e) Conditional Statement. (if ... then ... / $\rightarrow$)

Let p and q be the propositions, the conditional statement $p \rightarrow q$ is false when p is true and q is false otherwise true.

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

f) Biconditional Statement (if and only if / $\leftrightarrow$)

Let p and q be the propositions, the bicondition statement $p \leftrightarrow q$ is true when p and q have same truth values. otherwise false

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

- If $p \rightarrow q$ is the conditional statement ~~then~~ then.

1) Converse : $q \rightarrow p$
2) Inverse : $\sim p \rightarrow \sim q$
3) Contra positive : $\sim q \rightarrow \sim p$

eg: Find negation of following propositions

1) p: At least 10 inches of rain fall today in Mumbai.
   q: There is no pollution in New Jersey.
   r: It is raining now.

=> Negation of following propositions

$\sim p$: Less than 10 inches of rain fall today in mumbai.
$\sim q$: There is pollution in New Jersey
$\sim r$: It is not raining now.

but = and.

eg: 2) & p: it is below freezing
q: it is snowing

Write in following statement using p, q and logical connectives.

a) it is below freezing and snowing $p \wedge q$
b) it is below freezing but not snowing $p \wedge \sim q$
c) it is not below freezing and not snowing. $\sim p \wedge \sim q$
d) it is either snowing or below freezing $q \vee p$
e) if it is below freezing, it is also snowing. $p \rightarrow q$
f) That it is below freezing is necessary and sufficient for it to be snowing. $p \leftrightarrow q$

⇒ 3) Find conjuction and disjunction of following preposition.

p: Today is Friday
q: It is raining today.

→ Conjuction: (p and q) $p \wedge q$
Today is Friday and it is raining today.

Disconjuction: (p or q) $p \vee q$
Today is Friday or it is raining today.

Conditional: (if.. then..) $p \rightarrow q$
if Today is Friday then it is raining today

Biconditional: (iff) $p \leftrightarrow q$
Today is Friday if and only if it is raining today

4) p: You can take a flight
q: You buy a ticket

Conjuction: $(p \wedge q)$
You can take a flight and you ~~can~~ buy a ticke

Disconjuction: $(p \vee q)$
You can take a flight or you buy a ticket

Conditional: $(p \rightarrow q)$
If You can take a flight then you buy a ticke

Bidirectional: $(p \leftrightarrow q)$
You can take a flight if and only if
you ~~can~~ by buy a ticket.

~~alt:~~ alt: if you can take a flight it is ~~necss~~
necessary to buy a ticket.

5)