17-07-2021

Saturday

Name:- Parth Shantanu Deshpande Class:- XIIth Sub:- Maths (1)

TEST 3

(Q.1)

→ (1) p: Surat is in Gujrat. - T

q: $3+7=10$ - F.

S.F: $p \vee q$.

$\boxed{\therefore T.V = T}$.

(2) p: $2>1$. - T

q: $5 \cdot 2 = 3$ - F.

S.F: $p \rightarrow q$.

$\boxed{\therefore T.V = F}$.

(3) p: $27/3 = 9$. - T

q: $15-12 = 3$ - T.

S.F: $p \wedge q$

$\boxed{\therefore T.V = T}$.

(4) p: It is not True that $5+7=10$ - T

q: $3+5=8$ - T.

S.F: $p \vee q$.

$\boxed{\therefore T.V = T}$.

(Q.2)

→ (1) $(r \vee p) \rightarrow (\sim q)$.

$\Rightarrow (F \vee T) \rightarrow (\sim F)$.

$= F \rightarrow T$.

$\boxed{\therefore T.V = T}$.

(2) $(r \vee p) \leftrightarrow q$.

$\Rightarrow (F \vee T) \leftrightarrow F$

: F <-> F

$\boxed{\therefore T.V = T}$.

③ $(p \vee q) \wedge (q \rightarrow r)$

$\Rightarrow (T \vee F) \wedge (F \rightarrow F)$.

: T ∧ T.

$\boxed{\therefore T.V = T}$.

(Q.3)

→ ① $(\sim p \vee \sim q) \leftrightarrow [\sim(p \wedge q)]$.

⇒

① p	② q	③ $\sim p$	④ $\sim q$	⑤ $(\sim p \vee \sim q)$	⑥ $p \wedge q$	⑦ $\sim(p \wedge q)$	⑧ $(\sim p \vee \sim q) \leftrightarrow [\sim(p \wedge q)]$
T	T	F	F	F	T	F	T
T	F	F	T	T	F	T	T
F	T	T	F	T	F	T	T
F	F	T	T	T	F	T	T

∴ From the last 8th column of the Truth table we can conclude that the Statement pattern is of 'Tautology' as all the statements are True.

② $[(p \wedge q) \vee r] \wedge [\sim r \vee (p \wedge q)]$

⇒

① p	② q	③ r	④ $p \wedge q$	⑤ $[(p \wedge q) \vee r]$	⑥ $\sim r$	⑦ $[\sim r \vee (p \wedge q)]$	⑧ $[(p \wedge q) \vee r] \wedge [\sim r \vee (p \wedge q)]$
T	T	T	T	T	F	T	T
T	T	F	T	T	T	T	T
T	F	T	F	T	F	F	F
T	F	F	F	F	T	T	F
F	T	T	F	T	F	F	F
F	T	F	F	F	T	T	F
F	F	T	F	T	F	F	F
F	F	F	F	F	T	T	F

∴ From the 8th column of the Truth Table we can conclude that the statement pattern is on 'Contingency' as statements are True as well as False i.e. mixed.

(Q.4)

→ 1) $p \leftrightarrow q \equiv \sim(p \wedge \sim q) \wedge \sim(q \wedge \sim p)$.

=> 1 2 3 4 5 6 7 8 9

~~p q p↔q ~q p∧~q ~(p∧~q) ~p ~(q∧~p) ~(p∧~q)∧~(q∧~p)~~

1 2 3 4 5 6 7 8 9 10

p	q	$p \leftrightarrow q$	$\sim q$	$p \wedge \sim q$	$\sim(p \wedge \sim q)$	$\sim p$	$q \wedge \sim p$	$\sim(q \wedge \sim p)$	$\sim(p \wedge \sim q) \wedge \sim(q \wedge \sim p)$
T	T	T	F	F	T	F	F	T	T
T	F	F	T	T	F	F	F	T	F
F	T	F	F	F	T	T	T	F	F
F	F	T	T	F	T	T	F	T	T

From the above Truth Table, from the columns 3 & 10, it is proved that the given equation ~~following~~ statement ~~patterns are~~ is logically equivalent.

$\therefore p \leftrightarrow q \equiv \sim(p \wedge \sim q) \wedge \sim(q \wedge \sim p)$

Hence proved

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

=>

1 p	2 q	3 $p \vee q$	4 $\sim(p \vee q)$	5 $\sim p$	6 $\sim p \wedge q$	7 $\sim(p \vee q) \vee (\sim p \wedge q)$
T	T	T	F	F	F	F
T	F	T	F	F	F	F
F	T	T	F	T	T	T
F	F	F	T	T	F	T

$\therefore$ from the above Truth Table from the columns 5 & 7 it is proved that the given equation is logically equivalent.

$\therefore \sim(p \vee q) \vee (\sim p \wedge q) \equiv \sim p$

Hence proved

(Q.5)

→ 1) $(\sim p \vee q) \wedge (p \vee \sim q) \wedge (\sim p \vee \sim q)$

=> Dual = $(\sim p \wedge q) \vee (p \wedge \sim q) \vee (\sim p \wedge \sim q)$

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

$\Rightarrow \boxed{\therefore \text{Dual} \Rightarrow \sim(p \wedge q) \wedge (\sim p \vee q) \equiv \sim p.}$

(3) $(p \wedge \sim q \wedge r) \vee [p \wedge (\sim q \vee \sim r)]$

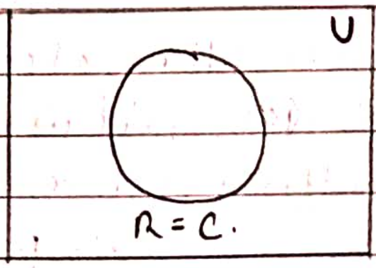
$\Rightarrow \boxed{\therefore \text{Dual} \Rightarrow (p \vee \sim q \vee r) \wedge [p \vee (\sim q \wedge \sim r)]}$

(4) $(p \rightarrow q) \vee (q \rightarrow p)$.

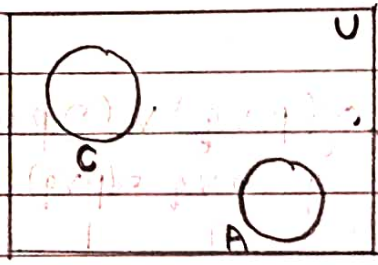
$\Rightarrow \boxed{\therefore \text{Dual} \Rightarrow (p \rightarrow q) \wedge (q \rightarrow p)}$

(Q.6)

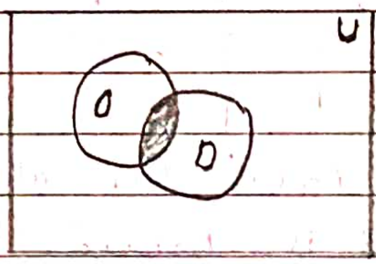
→ (1) U = Set of All numbers.
R = Set of All real numbers
C = Set of All complex numbers.



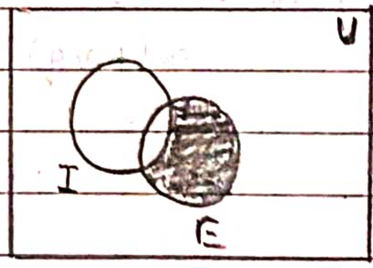
(2) U = Set of Human beings.
C = Set of all children.
A = Set of all Adults.



(3) ~~Son~~ U = Set of All numbers.
O = Set of all Odd numbers.
D = Set of numbers divisible by 5.



(4) U = Set of all Geometric Shapes.
I = Set of Isosceles Triangles
E = Set of Equilateral Triangles.



(Q.7)

→ (1) p : The number 6 is an even number.
q : The number 25 is a perfect square.
S.f : $p \vee q$.
$\therefore \sim(p \vee q) \equiv \sim p \wedge \sim q$ [By negation of disjunction]
Ans ⇒ The number 6 is not an even number and the number 25 is not a perfect square.

(2) p : There is no balance in Yusufs account
q : Yusuf cannot withdraw account.
S.f : $p \rightarrow q$.
$\therefore \sim(p \rightarrow q) \equiv p \wedge \sim q$ [By negation of Implication)
Ans ⇒ There is no balance in Yusuf's Account. and Yusuf. can withdraw account.

(3) p : A student will get a seat for M.B.A.
q : ~~Student~~ He student. is rich.
S.f : $p \leftrightarrow q$.
Ans ⇒ $\sim(p \leftrightarrow q) \equiv (p \wedge \sim q) \vee (q \wedge \sim p)$ [By negation of Double Implication).

∴ Ans ⇒ A student will get a seat for M.BA and he is not rich or ~~He~~ student is rich and a ~~student~~ he will not get a seat for M.B.A.

(Q.8)

→ (1) If a man is bachelor then he is unhappy
p : A man is bachelor.
q : ~~He~~ Man is unhappy.

Converse :- $q \rightarrow p$
⇒ If Man is unhappy then he is bachelor.

- Inverse:- $\sim p \to \sim q$

$\Rightarrow$ If A man is not a bachelor then ~~and~~ he is happy.

- Contrapositive:- $\sim q \to \sim p$

$\Rightarrow$ If A man is happy then ~~and~~ he is not a bachelor.

(2) p : Two triangles are congruent.

q : Their areas are equal.

- Converse:- ~~p~~ $q \to p$.

$\Rightarrow$ If Their areas are equal then the two triangles are congruent.

- Inverse:- $\sim p \to \sim q$

$\Rightarrow$ If two triangles are not congruent then their areas are not equal.

- Contrapositive:- $\sim q \to \sim p$

$\Rightarrow$ If Their areas are not equal then the two triangles are not congruent.