50612 11.
Ginne Vikas Reddy.

5.

	Abby	Bess	Cody	Dana
Abby	x		x	x
Bess		x		x
Cody			x	
Dana.		x	x	

Sol:-

$likes(Abby, Abby)$
$\sim likes(Abby, Bess)$
$likes(Abby, Cody)$
$likes(Abby, Dana)$

$\sim likes(Bess, Abby)$
$likes(Bess, Bess)$
$\sim likes(Bess, Cody)$
$likes(Bess, Dana)$

$\sim likes(Cody, Abby)$
$\sim likes(Cody, Bess)$
$likes(Cody, Cody)$
$\sim likes(Cody, Dana)$

$\sim likes(Dana, Abby)$
$likes(Dana, Bess)$
$likes(Dana, Cody)$
$\sim likes(Dana, Dana)$

1. $\forall x$ likes(x, x).

$\forall x \Rightarrow$ Universal

$x =$ Abby, Bess, Cody, Dana.

likes(Abby, Abby) True
likes(Bess, Bess) True
likes(Cody, Cody) True
likes(Dana, Dana). false.

$\forall x$ likes(x, x) is ~~true~~ false.

2. $\forall x \exists y$. likes(x, y). Everybody likes somebody.

$\exists y \Rightarrow$ Existential.

$\exists y$ likes(Abby, y) likes (Abby, Cody)
$\exists y$ likes(Bess, y) likes (Bess, Bess).
$\exists y$ likes(Cody, y) likes (Cody, Cody)
$\exists y$ likes(Dana, y) likes (Dana, Cody).

$\forall x \exists y$ likes(x, y) is true.

3. $\exists y . \forall x$ likes(x, y). ~~There is some one everyone likes.~~

~~liked~~ This is false because Dana doesnt likes herself.

$\exists y$ likes(Abby, Abby) True
$\exists y$ likes (Bess, Bess) True
$\exists y$ likes (Cody, Cody) True
$\exists y$ likes (Dana, Dana) false.

4. $\forall x \forall y \; Likes(x,y) \rightarrow Likes(y,x)$.

$\forall x \forall y \Rightarrow$ Universal so we must check for every Possibility.

for instance

Likes(Abby, Cody) True. But Likes(Cody, Abby) false

Hence.

$\forall x \forall y \; Likes(x,y) \rightarrow Likes(y,x)$ is false.

5. $\forall x \forall y \; (\exists z. \; Likes(x,z) \wedge Likes(z.y)) \rightarrow Likes(x,y)$.

Likes(Abby, Dana)

Likes(Dana, Ben)

$\neg$ Likes(Abby, Ben).

$\therefore \; \forall x \forall y (\exists z. \; Likes(x,z) \wedge Likes(z.y)) \rightarrow Likes(x,y)$ is false.

1. $\varphi_1 : p \to q$

$\varphi_2 : (q \to (s \wedge t))$

$\varphi_3 : (r \to (s \wedge t))$

$\varphi_4 : (p \vee r)$.

$\varphi = s \wedge t$

$\Phi = \{\varphi_1, \varphi_2, \varphi_3, \varphi_4\}$

To prove that $\Phi \models \varphi$, $s \wedge t$ is a logically consequence, use resolution method. Aim is to derive the empty clause from the CNF of $\Phi \cup \{\neg\varphi\}$

from ~~cnf~~ cnf

$(\varphi_1 \wedge \varphi_2 \wedge \varphi_3 \wedge \varphi_4) \wedge \sim\varphi$

$\varphi_1 : (p \to q) \equiv (\neg p \vee q)$. ($\because$ logically equivalent).

$\Rightarrow \{\neg p, q\}$

$\varphi \to \psi = \neg\varphi \vee \psi$

$\varphi_2 : (q \to (s \wedge t)) \equiv \neg q \vee (s \wedge t)$

$\equiv (\neg q \vee s) \wedge (\neg q \vee t) \Rightarrow \{\neg q, s\}$ $\{\neg q, t\}$

$\varphi_3 : (r \to (s \wedge t)) \equiv \neg r \vee (s \wedge t)$

$\equiv$ ~~$(\neg q \vee s) \wedge (\neg q \wedge t)$~~.

$\equiv (\neg r \vee s) \wedge (\neg r \vee t)$

~~φ_4~~

$\Rightarrow \{\neg r, s\}$

$\varphi_4 : p \vee r$.

$\{\neg r, t\}$.

कृ

1: $\{\neg p, q\}$
2. $\{\neg q, s\}$
3. $\{\neg q, t\}$
4. $\{\neg r, s\}$
5. $\{\neg r, s\}$
6. $\{p, r\}$
7. $\{\neg r, \neg t\}$

8: $(1,6) \rightarrow \{q, r\}$

9: $(8,7) \rightarrow \{q, \neg t\}$

10: $(9,3) \rightarrow \{\ \}$

8 : $\dfrac{\{\neg p, q\} \quad \{p, r\}}{\{q, r\}}$

9. $\dfrac{\{q, r\} \quad \{\neg t, \neg r\}}{\{q, \neg t\}}$

Teacher's Signature.........................

satisfy

If the set ϕ is not consisted we can derive every formulae φ as a logical consequence. But there is an intercep tition that satisfies. $\varphi_1 \wedge \varphi_2 \wedge \varphi_3 \wedge \varphi_4$, so the set ϕ is consisted.

The interpretation is $p^i = F$, $q^i = F$, $r^i = T$, $s^i = T$, $t^i = T$.

This continue with revolution method and try to derive empty close.

$\Rightarrow$ Thus $s \wedge t$ is logically consequence of $\phi = \{\varphi_1, \varphi_2, \varphi_3, \varphi_4\}$.