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Artificial Intelligence - 1^{st} sem - Exam

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7Q. Propositional logic

→ Following formulas.

- φ_1 : $(p \rightarrow q)$
- φ_2 : $(q \rightarrow (s \wedge t))$
- φ_3 : $(r \rightarrow (s \wedge t))$
- φ_4 : $(p \vee r)$

(1)

Sol)

To prove that $\phi \models \psi$, is $s \wedge t$ is a logical consequence; use resollution method. then the procedure is derive the empty clause from

CNF of $\phi \cup \{\neg\psi\}$

$\psi_1 : p \to q \to \neg p \vee q - \{\neg p, q\}$

$\psi_2 = q \to (s \wedge t) \to \neg q \vee (s \wedge t) \to (\neg q \vee s) \wedge (\neg q \vee t) \to$

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

$\{\neg q, t\}$

$\psi_3 : r \to (s \wedge t) \to \neg r \vee (s \wedge t) \Rightarrow (\neg r \vee s) \wedge (\neg r \vee t)$

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

$\{\neg r, t\}$

$\psi_4 : p \vee r \Rightarrow \{p, r\}$

$\neg\psi : \neg(s \wedge t) \Rightarrow \neg s \vee \neg t \Rightarrow \{\neg s, \neg t\}$

= 1: $\{\neg p, q\}$

2: $\{\neg q, s\}$

3: $\{\neg q, t\}$

4: $\{\neg r, s\}$

5: $\{\neg r, t\}$

6: $\{p, r\}$

7: $\{\cancel{\neg r}\ \neg r, \neg t\}$

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

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

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

If the set ϕ is not consistent, can derive every formula φ as a logical consequence. But there is an interpretation that satisfies $\varphi_1 \wedge \varphi_2 \wedge \varphi_3 \wedge \varphi_4$, so the set ϕ is consistent.

The interpretation is ~~$p' = F$~~

$p' = F$. $q' = F$, $r' = T$, $s' = T$, $t' = T$

Thus consistance with resolution method and try to derive empty clause.

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

$\{q, r\}$

9: $\{q, r\}$
$\{\neg t, \neg r\}$

$\{q, \neg t\}$

10. $\{q, \neg t\}$
$\{\neg q, t\}$

$\{\ \}$

=) There $s \wedge t$ is a logical consequence of

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

(5)

Q

	Abby	Bess	Cody	Dana
Abby	x	–	x	x
Bess	–	x	–	x
Cody	–	–	x	–
Dana	–	x	x	–

and tell which.

Sol) $\forall x$ likes (x, x)

a) likes $(a, a) = T$

likes $(b, b) = T$

likes $(c, c) = T$

likes $(d, d) = F$

There the sentence is false, because to ~~sofi~~ satisfy the quantifier for all general sentences ~~as~~ must be True.

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

$\Rightarrow \exists y.\ likes(a,y) \Rightarrow likes(a,a) = T$

$likes(a,b)$

$likes(a,c)$

$likes(a,d)$

$\exists y\ likes(c,y) = likes(c,a)$

$likes(c,b)$

$likes(c,c) = T$

$likes(c,d) =$

$\exists y\ likes(b,y) \Rightarrow likes(b,a)$

$likes(b,b) = T$

$likes(b,c)$

$likes(b,d)$

$\exists y\ likes(d,y) \Rightarrow likes(d,a) = F$

$likes(d,b) = T$

$likes(d,c) = T$

$likes(d,d) = F$

From sentence one, of Graph i know that there's one interpretation that satisfy the statement:

$\exists y$, likes (a,y), $\exists y$ likes (b,y) $\exists y$ likes (c,y)

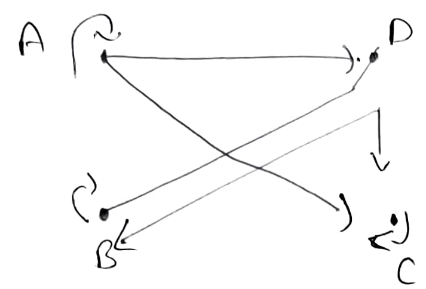
Then for finding truth i check $\exists y$ likes (d,y) that must be true to satisfy.

2. likes (d,b) and likes (d,c) are true, so all statement 2 is true

3. $\exists y. \forall x$ likes (x,y) NOT true.

Drawing the model of "Sorority world" ~~where~~

~~in the cell x, y denotes that~~



The given Sentence is satisfied if existence an individual that is liked by everyforce, so in the forces of, but in this case statement is not satisfied so sentence 3.

4. $\forall x \forall y$ likes $(x,y) \rightarrow$ likes (y,x) NOT True

This would be satisfied if "likes" was symmetric in the model, but for instance likes (a,c) is satisfied likes (c,a) is not Thus Sentence 4 is false

(5) $\forall x \forall y\ (\exists z\ likes(x, z) \wedge likes(z, y)) \rightarrow likes(x, y)$ Not True.

This would be satisfied if "likes" was transitive in the ~~model~~, but likes (a,d)

likes (d, b)

$\neg$ likes (a, b)

$\therefore$ Therefore sentence, 5 is not ~~sa~~ satisfied.