Assignment Questions on FOPL

CS(H) VI SEMESTER

Date : 24th March 2020 **Due date of submission: 26th March 2020**

How to Submit:

- The solution should be handwritten.
- Each page should have the name and roll number of student.
- Prepare a pdf of all the pages of the solution (can use camscanner) , and
- mail it to sunita_mk@rediffmail.com before the due date.

Q1. Determine whether each of the following sentence is :

i) Satisfiable ii) Contradictory iii) Valid

S1: $P \rightarrow Q \rightarrow \sim P$

S2: $(P \& Q) \vee \sim(P \& Q)$

S3: $(P \vee Q) \rightarrow \sim(P \& Q)$

S4: $P \vee Q \ \& \sim P \vee \sim Q \ \& \ P$

Q2. Transform the following formula to clausal form :

a) $\forall x \, \forall y \, (\exists z \, P(x,z) \& \, P(y,z)) \rightarrow \exists u Q(x,y,u)$

b) $\exists x \, \forall y \, (\, \forall z \, P(f(x),y,z)) \rightarrow (\exists \, Q(x,u) \ \& \exists v \, R(y,v))$.

Q3. Translate the following sentences into clausal form and use resolution technique-refutation proof method to draw the required inference.

a) S1: Some patients like all doctors.

S2: No patient likes any quack.

Conclusion: Therefore, no doctor is a quack.

b) S1: Every boy or girl is a child.
S2: Every child gets a doll or a train or a lump of coal.
S3: No body gets any doll.
S4: No child who is good gets any lump of coal.

Conclusion: If no child gets a train, then no boy is good.

c) S1 : Harry , Ron and Draco are students of the Hogwarts school for wizards.
S2 : Every student is either wicked or is a good Quidditch player, or both

S3 : No Quidditch player likes rain and all wicked students like potions
S4 : Draco dislikes whatever Harry likes and likes whatever Harry dislikes
S5 : Draco likes rain and potions
Conclusion: Is there a student who is good in Quidditch but not in potions

Q4. Transform the following into CNF:

a) $P \vee (\sim P \ \& \ Q \ \& \ R)$
b) $(\sim P \ \& \ Q) \vee (P \ \& \sim Q) \ \& \ S$

Q5 Find the meaning of the statement

$(\sim P \vee Q) \ \& \ R$

Q6 Create the well formed formula in FOPL for the following:

a) "Gold and Silver ornaments are precious" where:

G(x) : x is a Gold ornament

S(x) : x is a silver ornament

P(x) : x is precious

b) "Every teacher is liked by some student"
c) "Some boys in the class are taller than all the girls"

Q7. Find the correct interpretation of the following formula :

F(x,y,t) : person $\boldsymbol{x}$ can fool person $\boldsymbol{y}$ at time $\boldsymbol{t}$.

$\forall \boldsymbol{x} \ \exists \boldsymbol{y} \exists \boldsymbol{t} \ (\sim \boldsymbol{F}(\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{t})$

a) Everyone cam fool some person at some time
b) No one can fool everyone all the time
c) Everyone can not fool some person all the time
d) No person can fool some person at some time

Also create the formulas for the incorrect(remaining) interpretations