Q] $K = \{$ Vegan $\equiv$ Person $\sqcap$ $\forall$ eats. Plant,

Vegetarian $\equiv$ Person $\sqcap$ $\forall$ eats. (Plant $\sqcup$ Dairy),

Vegan $\sqsubseteq$ Vegetarian $\}$

↳ consequence.

$K = \{$ Vegan $\equiv$ Person $\sqcap$ $\forall$ eats. Plant,

Vegetarian $\equiv$ Person $\sqcap$ $\forall$ eats. (Plant $\sqcup$ Dairy),

Vegan $\sqcap$ $\neg$ Vegetarian $\}$

↳ Negation (NNF (consequence))

Now, consider,

Vegan $\sqcap$ $\neg$ Vegetarian

(Person $\sqcap$ $\forall$ eats. Plant) $\sqcap$ $\neg$ (Person $\sqcap$ $\forall$ eats. (Plant $\sqcup$ Dairy))

(Person $\sqcap$ $\forall$ eats. Plant) $\sqcap$ ($\neg$Person $\sqcup$ $\exists$ eats. ($\neg$Plant $\sqcap$ $\neg$Dairy))

As there are no A-box axioms given, we can consider (or) apply, the knowledge base to any arbitrary variable.

Step 1:- $x \cdot L(x) = \{ (Person \sqcap \forall eats \cdot Plant) \sqcap (\neg Person \sqcup \exists eats \cdot (\neg Plant \sqcap \neg Dairy)) \}(x)$

Applying $\sqcap$-rule

Step 2:- $x \cdot L(x) = \{ Person(x), \forall eats \cdot Plant(x), (\neg Person \sqcup \exists eats \cdot (\neg Plant \sqcap \neg Dairy))(x) \}$

Applying $\sqcup$-rule, gives raise to two branches,

Step 3:-

Branch 1:- $x \cdot L(x) = \{ Person(x), \forall eats \cdot Plant(x), \neg Person(x) \}$ (Clashes)

Branch 2:- x, $L(x) = \{ Person(x), \forall eats \cdot Plant(x), \exists eats \cdot (\neg Plant \sqcap \neg Dairy)(x) \}$

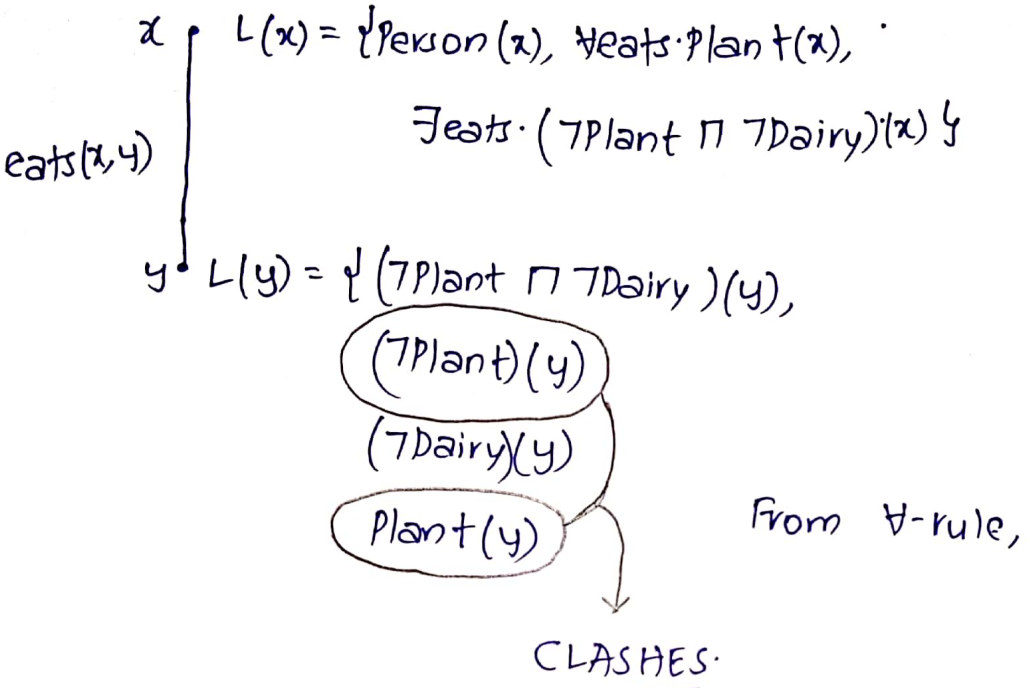
Applying $\exists$-rule.

eats(x,y)

y • $L(y) = \{ (\neg Plant \sqcap \neg Dairy)(y) \}$

Step 4:-

Applying $\sqcap$-rule.



As all the branches clashes and closed,

Therefore, $KB \models \{Vegan \equiv Vegetarian\}$ is true.

Q2]

(i)

(a) $Team \sqsubseteq \geq 1\ takesPartIn \cdot ChampionshipTour$

(b) $ChampionshipTour \sqsubseteq (\geq 1\ isOrganizedBy \cdot Team \sqcap \geq 1\ consistsOf \cdot Tournament)$

(c) $Tournament \sqsubseteq \exists\ belongsTo \cdot ChampionshipTour \cdot$

(d) $Sportsman \sqsubseteq (Person \sqcap \geq 1\ plays \cdot SportGame)$

(e) $TeamMember \sqsubseteq (Sportsman \sqcap \geq\ playsFor \cdot Team)$

(f) $StrongAthlete \sqsubseteq (Sportsman \sqcap (TeamMember \sqcup \geq 3\ plays \cdot SportGame))$

(g) $Footballer \sqsubseteq (Person \sqcap \geq 1\ playsFor \cdot FootballTeam)$

(h) $Trainer \sqsubseteq (Person \sqcap \geq 1\ responsibleFor \cdot Team)$

(i) $Master \sqsubseteq (Person \sqcap (Sportsman \sqcap Trainer))$

(j) $SportGame \sqsubseteq \exists\ isPlayedAt \cdot Tournament$

(or)

$SportGame \sqsubseteq \geq 1\ IsPlayedAt \cdot Tournament \cdot$

(k) $TeamSport \sqsubseteq SportGame \sqcap \geq 1\ hasWinner \cdot Team$

(l) $PopularSport \sqsubseteq SportGame \sqcap \geq 2\ isPlayedAt \cdot Tournament$.

(m) $MultisportTeam \sqsubseteq Team \sqcap \geq 2\ plays \cdot knownSportGame$

(n) $InterestingTournament \sqsubseteq Tournament \sqcap$

$hasWinner \cdot DebutTeam$

(o) $SmallSportEvent \sqsubseteq Tournament \sqcap$.

$\leq 2\ includes \cdot SportGame$.

Competency Questions for Q2

1) What are the teams which take part in Championship Tour BVOct?
2) What tournaments belong to the ChampionShip Tour BVNov?
3) Who is responsible for team 'ABC'?
4) Who is a strong athlete who plays rugby,volleyball and football?
5) Who organizes Championship Tour FROct?
6) Who are all the Sportsmen who plays SportGame4?
7) Who are all playing for Team Sunrisers?
8) What are the SportGames played by 'Tim'?
9) Who is the winner of Tournament 'BVNov1'?
10) What are all the PopularSport played at Tournaments 'BVOct1' and 'BVOct2'?