26/11/24 Week 8

Q1) Create a knowledge base consisting of first order logic statements and prove the given using forward reasoning.

Algorithm:

1. Initialize the knowledge base
   - Define the facts and rules in the knowledge base.
   - Define the query you want to prove (eg - Criminal(West))

2. Initialize the working query.
   - set up working memory with the initial facts.
   - This memory will hold the current known fact and will be updated as we apply rules.

3. Apply forward chaining.
   - 1) While there are still facts to process.
      * find applicable rules: for each rule in the knowledge base, check if the premises (condition) are satisfied with the current facts in the working memory.
   2) Generate new facts:
      if the rules conditions are satisfied apply the rule to infer new facts and add them to the working memory.
   3) Check the Query.
      After each iteration, check if the query is in the working memory.

4. Repeat: continue applying rules until the query is found or no more rules can be applied.

4. Return the Result:
- If the query is found in the working memory, return True.
- If the query is not found, return False.

Forward Chaining Proof:

* It is a crime for an American to sell weapons to hostile nations.

$American(p) \wedge weapon(q) \wedge sells(p, q, r) \wedge hostile(r) \Rightarrow Criminal(p)$

* Country A has some missiles.

$\exists x \; Owns(A, x) \wedge missile(x)$

$\Rightarrow$ $Owns(A, T1)$
$Missile(T1)$

* All the missiles were sold to country A by Robert

$\forall x \; Missile(x) \wedge Owns(A, x) \Rightarrow Sells(Robert, x, A)$

* Missiles are weapons.

$Missile(x) \Rightarrow weapon(x)$

4. Enemy of America is known as hostile

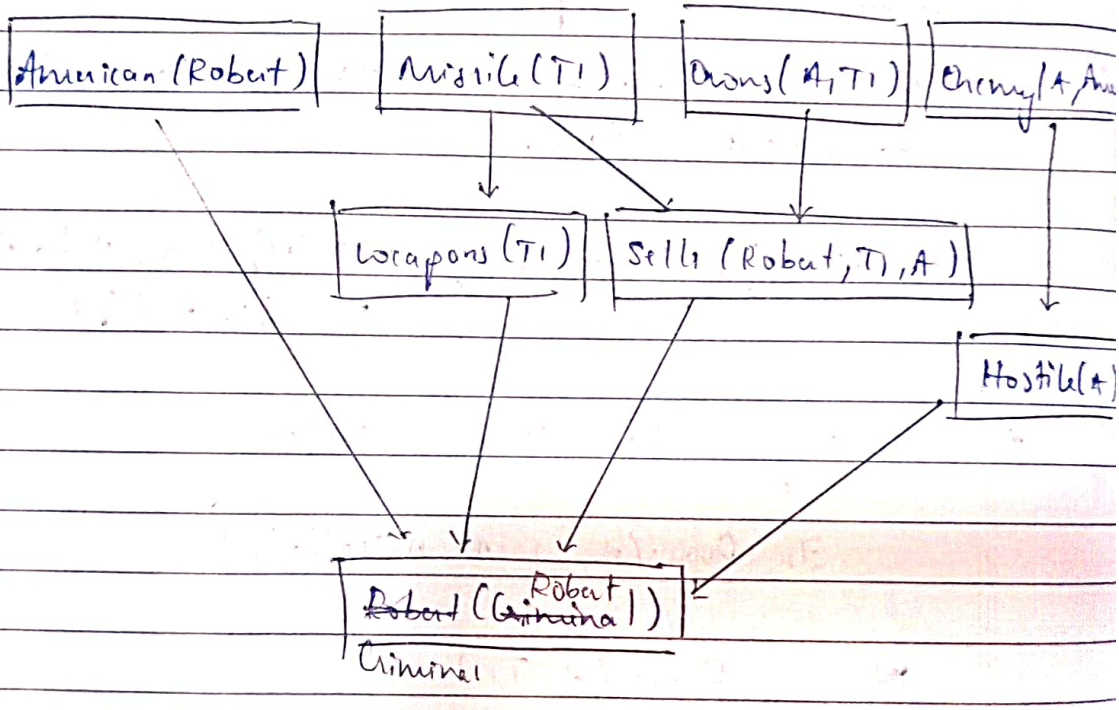
$\forall x$ Enemy(x, America) $\Rightarrow$ Hostile(x)

5. Robert is a American

American(Robert)

6. The country A, an enemy of America

Enemy(A, America)



Output:

Criminal(Robert)

26.11