

Logic Class Work Problems

1. Suppose a new pet, called Fotik, is delivered in an opaque (non-transparent) box along with **two facts** about Fotik:

Fact 1: Fotik croaks

Fact 2: Fotik eats flies

Suppose you have a **rule base** containing the following four rules:

Rule 1: If X croaks and X eats flies – Then X is a frog

Rule 2: If X chirps and X sings – Then X is a canary

Rule 3: If X is a frog – Then X is green

Rule 4: If X is a canary – Then X is yellow

Use a **backward chaining** process to **decide whether Fotik is green**

2. Consider a vocabulary with the following symbols:

Occupation (p, o): Predicate. Person p has occupation o.

Customer (p1, p2): Predicate. Person p1 is a customer of person p2.

Boss (p1, p2): Predicate. Person p1 is a boss of person p2.

Doctor, Surgeon, Lawyer, Actor : Constants denoting occupations.

Shuvra, Himel: Constants denoting people.

Two examples of conversion from English statements to first order logic are given for your convenience:

Example 1: Himel is an actor, but he also holds another job:

$\text{Occupation}(\text{Himel}, \text{Actor}) \wedge \exists o [o \neq \text{Actor} \wedge \text{Occupation}(\text{Himel}, o)]$

Example 2: All surgeons are lawyers:

$\forall p \text{ Occupation}(p, \text{Surgeon}) \Rightarrow \text{Occupation}(p, \text{Doctor}).$

Use the given symbols to write the following assertions in **first-order logic**. (20 points)

- i. Shuvra is either a surgeon or a lawyer.
- ii. Himel does not have a lawyer (i.e., is not a customer of any lawyer).
- iii. Shuvra has a boss who is a lawyer.
- iv. There exists a lawyer all of whose customers are doctors.
- v. Every surgeon has a lawyer.