

S. V. National Institute of Technology Surat
CO 405: PRINCIPLE OF PROGRAMMING LANGUAGES (CS-IV)
Assignment-1

- 1) Write a program in Prolog that uses following predicates
Write, nl, read, consult, halt, statistics.
- 2) Try to answer the following questions first “by hand” and then verify your answers using a Prolog interpreter.
 - (a) Which of the following are valid Prolog atoms?
f, loves(john,mary), Mary, _c1, 'Hello', this_is_it
 - (b) Which of the following are valid names for Prolog variables?
a, A, Paul, 'Hello', a_123, _, _abc, x2
 - (c) What would a Prolog interpreter reply given the following query?
?- f(a, b) = f(X, Y).
 - (d) Would the following query succeed?
?- loves(mary, john) = loves(John, Mary).
Why?
 - (e) Assume a program consisting only of the fact
a(B, B).
has been consulted by Prolog. How will the system react to the following query?
?- a(1, X), a(X, Y), a(Y, Z), a(Z, 100).
Why?
- 3) Read the section on matching again and try to understand what's happening when you submit the following queries to Prolog.
 - (a) ?- myFunctor(1, 2) = X, X = myFunctor(Y, Y).
 - (b) ?- f(a, _, c, d) = f(a, X, Y, _).
 - (c) ?- write('One '), X = write('Two ').
- 4) Draw the family tree corresponding to the following Prolog program:
female(mary).
female(sandra).
female(juliet).
female(lisa).
male(peter).
male(paul).
male(dick).
male(bob).
male(harry).
parent(bob, lisa).
parent(bob, paul).
parent(bob, mary).
parent(juliet, lisa).
parent(juliet, paul).
parent(juliet, mary).

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parent(peter, harry).  
parent(lisa, harry).  
parent(mary, dick).  
parent(mary, sandra).
```

After having copied the given program, define new predicates (in terms of rules using male/1, female/1 and parent/2) for the following family relations:

- (a) father
- (b) sister
- (c) grandmother
- (d) cousin

You may want to use the operator \neq , which is the opposite of $=$. A goal like $X \neq Y$ succeeds, if the two terms X and Y cannot be matched.

Example: X is the brother of Y , if they have a parent Z in common and if X is male and if X and Y don't represent the same person. In Prolog this can be expressed through the following rule:

```
brother(X, Y) :-  
    parent(Z, X),  
    parent(Z, Y),  
    male(X),  
    X  $\neq$  Y.
```