Indian Institute of Technology, Indore Computer Science & Engineering CS 354N: DATE: 05 January 2022
Assignment I-Prolog

1) The predicate **parent**(john,ann) is interpreted as: "John is a parent of Ann".
Formulate in Prolog the following questions about the **parent** relation a)
Who is Pat's parent?
b) Does Liz have a child?
c) Who is Pat's grandparent?

2) The predicate parent(X,Y) is interpreted as: "X is a parent of Y".
The predicate sister(X,Y) is interpreted as: "X is the sister of Y".
Write prolog rules for following:
a) Everybody who has a child is happy (introduce a one-argument relation **happy**) b) For all X, if X has a child who has a sister then X has two children (introduce new relation **hastwochildren**)
c) **grandchild** using parent relation.
d) **aunt** using relations parent and sister.

3) female(mary).
female(sandra).
female(juliet).
female(lisa).
male(peter).
male(paul).
male(john).
male(bob).
male(harry).
parent(bob, lisa).
parent(bob, paul).
parent(bob, mary).
parent(juliet, lisa).
parent(juliet, paul).
parent(juliet, mary).
parent(peter, harry).
parent(lisa, harry).parent(mary, john).
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 \=, which is the opposite of =. A goal like X \= 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 \= Y.
```

4) Prolog program records information about the soldiers of an army and their ranks, such as:
"Peckem is a general."
"Cathcart is a colonel."
"Moodus is a colonel."
Facts are as follows.

```
soldier (peckem, general).
soldier (cathcart, colonel).
soldier (moodus, colonel).
soldier (towser, sergeant).
soldier (knight, sergeant).
soldier (aardvark, captain).
soldier (dunbar, lieutenant).
soldier (flume, captain).
soldier (danby, major).
```

Write rule for the following."Do Aardvark and Flume hold the same rank?"

5)

```
parent(chester,irvin).
parent(chester,clarence).
parent(chester,mildred).
parent(irvin,ron).
parent(irvin,ken).
parent(clarence,shirley).
parent(clarence,sharon).
parent(clarence,charlie).
parent(mildred,mary).
```

Try some queries
Some queries:

```
?- parent(chester,mildred).
yes
?- parent(X,ron).
X = irvin
```

yes
Now define rule predicate for “X is an ancestor of Y”.