**Q. Edit a file and enter the following database of facts. Save the file under the name “family.pl”**

**parent(abraham,homer).**

**parent(mona,homer).**

**parent(clancy,marge).**

**parent(jackie,marge).**

**parent(jackie,selma).**

**parent(jackie,patty).**

**parent(homer,bart).**

**parent(homer,lisa).**

**parent(marge,bart).**

**parent(marge,lisa).**

***A. Load “family.pl” and find the answer to the following questions:***

(a) Is Abraham a parent of Bart?

parent(abraham,bart).

false

(b) Is Lisa a child of Mona?

parent(mona,lisa).

false

(c) Who are Bart’s parent?

parent(X,bart).

X=homer;

X=marge.

(d) Who are Homer’s children?

parent(homer,X).

X=bart;

X=lisa.

***B. Add the following facts to the database using only the parent predicate:***

(a) Maggie is the daughter of Homer and Marge.

parent(homer,maggie).

parent(marge,maggie).

(b) Selma is the parent of Ling.

parent(selma,ling).

***C. Find the answer to the following queries:***

(a) Who are the grandchildren of Abraham?

grandchildren(X,Y):-parent(X,some),parent(some,Y).

grandchildren(abraham,X).

X=bart;

X=lisa

(b) Who are the grandchildren of Clancy who have Marge as a parent?

grandchildrenparent(X,Y,some):-parent(X,some),parent(some,Y).

grandchildrenparent(clancy,X,marge).

X=bart;

X=lisa;

***D. Augment the database with predicates to distinguish between male and female persons.***

male(abraham).

male(homer).

male(bart).

female(clancy).

female(marge).

male(jackie).

female(selma).

female(lisa).

female(maggie).

female(patty).

female(mona).

female(ling).

***E. Query the database to find out:***

(a) Who are the male children of Marge?

parent(marge,X),male(X).

X = bart ;

(b) Who is Lisa’s father?

?- parent(X,lisa),male(X).

X = homer ;

(c) Who is Bart’s grandfather?

grandchildren(X,bart),male(X).

X=abraham;

X=clancy;

***F. Augment the database with rules and predicate for the following relations:***

1. mother

mother(X,Y):- parent(X,Y),female(X).

1. father

father(X,Y):-parent(X,Y),male(X).

1. grandfather

grandfather(X,Y) :- parent(X,Anyone), parent(Anyone,Y),male(X).

1. grandmother

grandmother(X,Y) :- parent(X,Anyone), parent(Anyone,Y),female(X).

***G. Add the different relation to your database, which is true if its two arguments are not the same, and is deﬁned as follows.***

different(X,X):-!,fail.

different(X,Y).

***H. Now, augment the database with rules and predicates for the following relations:***

1. sister(X,Y):-different(X,Y),parent(Z,X),parent(Z,Y),female(X).
2. brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),different(X,Y).
3. aunt(X,Y):-parent(Z,Y),sister(X,Z),different(X,Y),female(X).
4. uncle(X,Y):-parent(Z,Y),sister(X,Z),different(X,Y),male(X).
5. cousin(X,Y):- aunt(Z,Y),parent(Z,X),different(X,Y).
6. siblings(X,Y):-parent(Z,X),parent(Z,Y),different(X,Y).