**GUJARAT TECHNOLOGICAL UNIVERSITY**

**Government Engineering College, Bhavnagar**

# Subject: **Artificial Intelligence**

# B.E. C.E. Semester

## 7th (Computer Branch)

**Submitted By:**

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# Artificial Intelligence

**Practical-1: Write a PROLOG program that list four addresses in a label form, each address should list a name, one-line address, city, state &ZIP code.**

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## Code in Prolog:

## Domains

```
Name,Soci,Mycity,Sta,Code = String
```

## Predicates

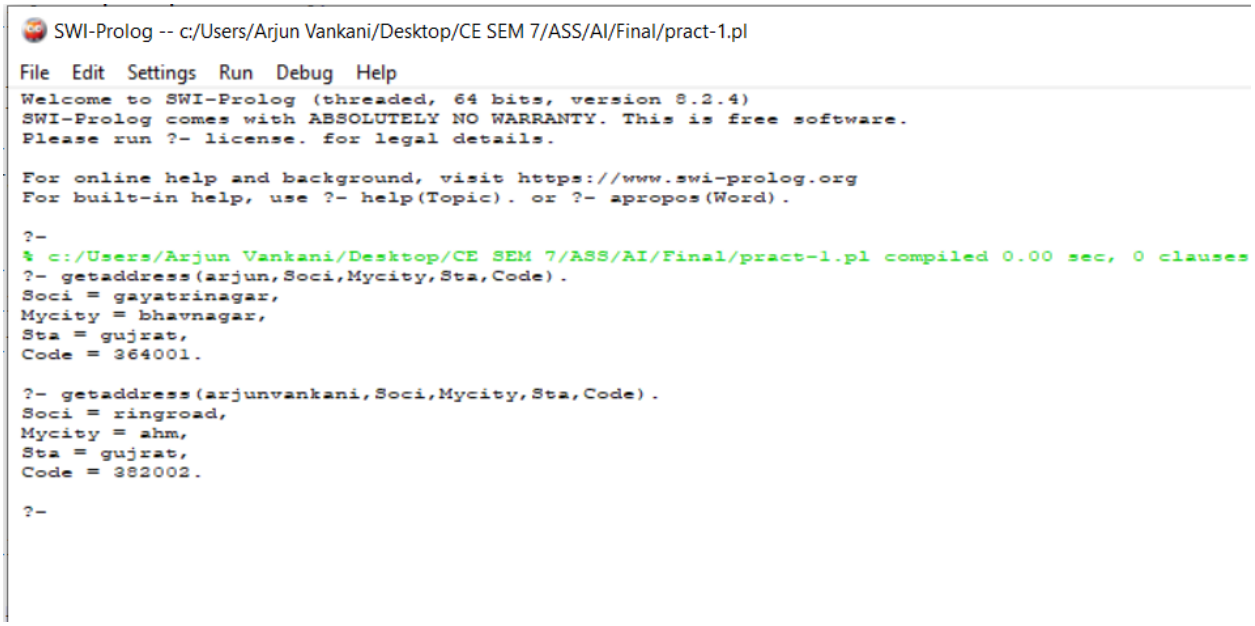
```
getaddress(Name,Soci,Mycity,Sta,Code).
```

## Clauses

```
soc(arjun,gayatrinagar).
soc(vankani,victoria).
soc(arjunvankani,ringroad).

city(arjun,bhavnagar).
city(vankani,broda).
city(arjunvankani,ahm).

state(arjun,gujrat).
state(vankani,gujrat).
state(arjunvankani,gujrat).
```

```
zip(arjun,364001).
zip(vankani,314001).
zip(arjunvankani,382002).

getaddress(Name,Soci,Mycity,Sta,Code):-

    soc(Name,Soci),
    city(Name,Mycity),
    state(Name,Sta),
    zip(Name,Code).
```

## Output:



## Practical-2: WAP to Create Database for Hobbies of Different Person.

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### Code in Prolog:

### Domains

Name,hobbies = True or False

### Predicates

likes(arjun,chess).

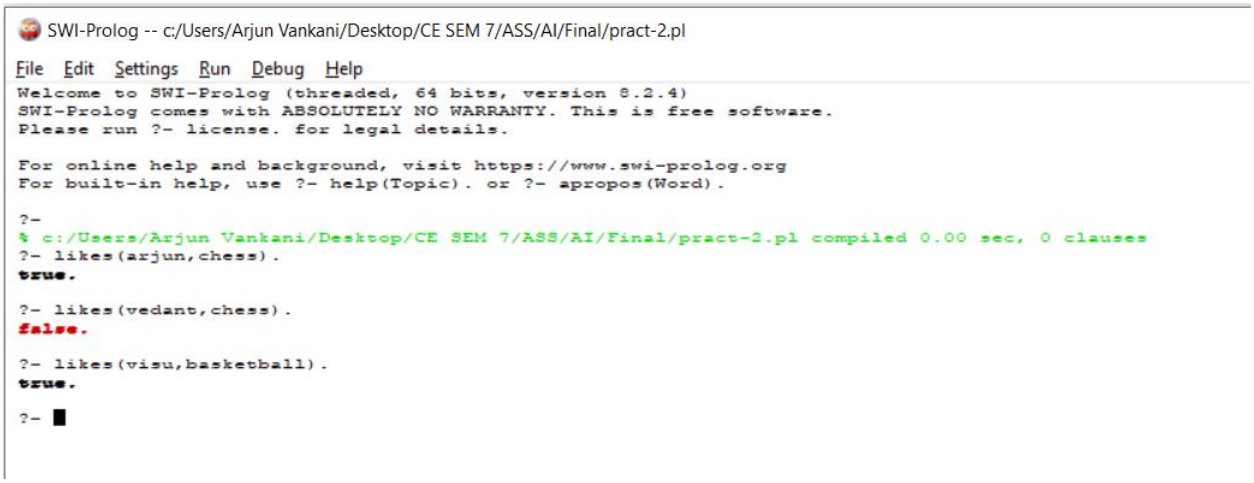
### Clauses

likes(arjun,chess).

likes(vedant,volleyball).

likes(visu,basketball).

### Output:



## Practical-3: Write a PROLOG program for diagnosis the childhood diseases.

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**Code in Prolog:**

```
Domains

        Patient,Disease = String


Predicates

        hypothesis(patient,Disease).

Clauses

        symptom(arjun,fever).

        symptom(arjun,headache).

        symptom(arjun,runnynose).

        symptom(arjun,rash).


        hypothesis(patient,measles):-

                symptom(Patient,fever),

                symptom(Patient,cough),

                symptom(Patient,conjunctive),

                symptom(Patient,runnynose),

                symptom(Patient,rash).
```

```
hypothesis(Patient,germanmeasles):-
        symptom(Patient,fever),
        symptom(Patient,headache),
        symptom(Patient,runnynose),
        symptom(Patient,rash).

hypothesis(Patient,flu):-
        symptom(Patient,fever),
        symptom(Patient,headache),
        symptom(Patient,bodyache),
        symptom(Patient,chills),
        symptom(Patient,sorethrought),
        symptom(Patient,cough),
        symptom(Patient,conjunctive),
        symptom(Patient,conjunctive),
        symptom(Patient,runnynose).

hypothesis(Patient,commoncold):-
        symptom(Patient,headache),
        symptom(Patient,runnynose),
        symptom(Patient,snuzing),
        symptom(Patient,chills),
```

```
        symptom(Patient,sorethrought).
hypothesis(Patient,mumps):-
        symptom(Patient,fever),
        symptom(Patient,swallenglands).
hypothesis(Patient,chikenpox):-
        symptom(Patient,fever),
        symptom(Patient,rash),
        symptom(Patient,bodyache).
hypothesis(Patient,whooping-cough):-
        symptom(Patient,runnynose),
        symptom(Patient,snuzing),
        symptom(Patient,cough).
```

## Output:

## Practical-4: Write a PROLOG program for Family Relationship.

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**Code in Prolog:**

**Domains**

**Person = symbol**

**Predicates**

male(person)

female(person)

parent(person,person)

father(person,person)

mother(person,person)

sister(person,person)

brother(person,person)

son(person,person)

daughter(person,person)

aunt(person,person)

uncle(person,person)

child(person,person)

wife_of(person,person)

husband_of(person,person)

grand_father(person,person)

grand_mother(person,person)

cousin(person,person)

nephew(person,person)

## Clauses

**male(arjun).**

**male(bakulbhai).**

**male(natubhai).**

**female(bharvi).**

**female(arunaben).**

**female(kundanben).**

**child(arjun,bakulbhai).**

**child(arjun,arunaben).**

**child(bharvi,bakulbhai).**

**child(bharvi,arunaben).**

**child(bakulbhai,natubhai).**

**child(bakulbhai,kundanben).**

**brother(X,Y):-**

**male(X),**

**child(X,Z),**

**child(Y,Z),**

**X\=Y.**

```
sister(X,Y):-
   female(X),
   child(X,Z),
   child(Y,Z),
   X\=Y.
father(X,Y):-
   male(X),
   child(Y,X).
mother(X,Y):-
   female(X),
   child(Y,X).
grandfather(X,Y):-
   male(X),
   child(Y,Z),
   child(Z,X).
grandmother(X,Y):-
   female(X),
   child(Y,Z),
   child(Z,X).
ancestor(X,Y):-
   male(X),
   child(Y,Z),
```

```
child(Z,X);

female(X),

child(Y,Z),

child(Z,X).
```

## Output:

```
SWI-Prolog -- c:/Users/Arjun Vankani/Desktop/CE SEM 7/ASS/AI/Lab3/Family.pl
File  Edit  Settings  Run  Debug  Help
Welcome to SWI-Prolog (threaded, 64 bits, version 8.2.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?-
% c:/Users/Arjun Vankani/Desktop/CE SEM 7/ASS/AI/Lab3/Family.pl compiled 0.00 sec, 0 clauses
?- father(X,arjun).
X = bakulbhai .

?- mother(X,bharvi).
X = arunaben .

?- brother(X,bharvi).
X = arjun .

?- sister(X,arjun).
X = bharvi .

?- grandfather(arjun,X)
|    .
false.

?- grandfather(X,arjun).
X = natubhai .

?- grandmother(X,bharvi).
X = kundanben .

?- ancestor(X,Y)
|    .
X = natubhai,
Y = arjun .

?- child(X,Y).
X = arjun,
Y = bakulbhai .

?- female(X).
X = bharvi .

?- mother(arunaben,bharvi)
|    .
true.

?- mother(X,Y).
X = arunaben,
Y = arjun .

?-
```

- **Practical-5: A) Give an opportunity to user to re-enter the password 'n' no. Of times, on entering wrong password. B) Give an opportunity to user to re-enter the password three (03) times, on entering wrong password.**

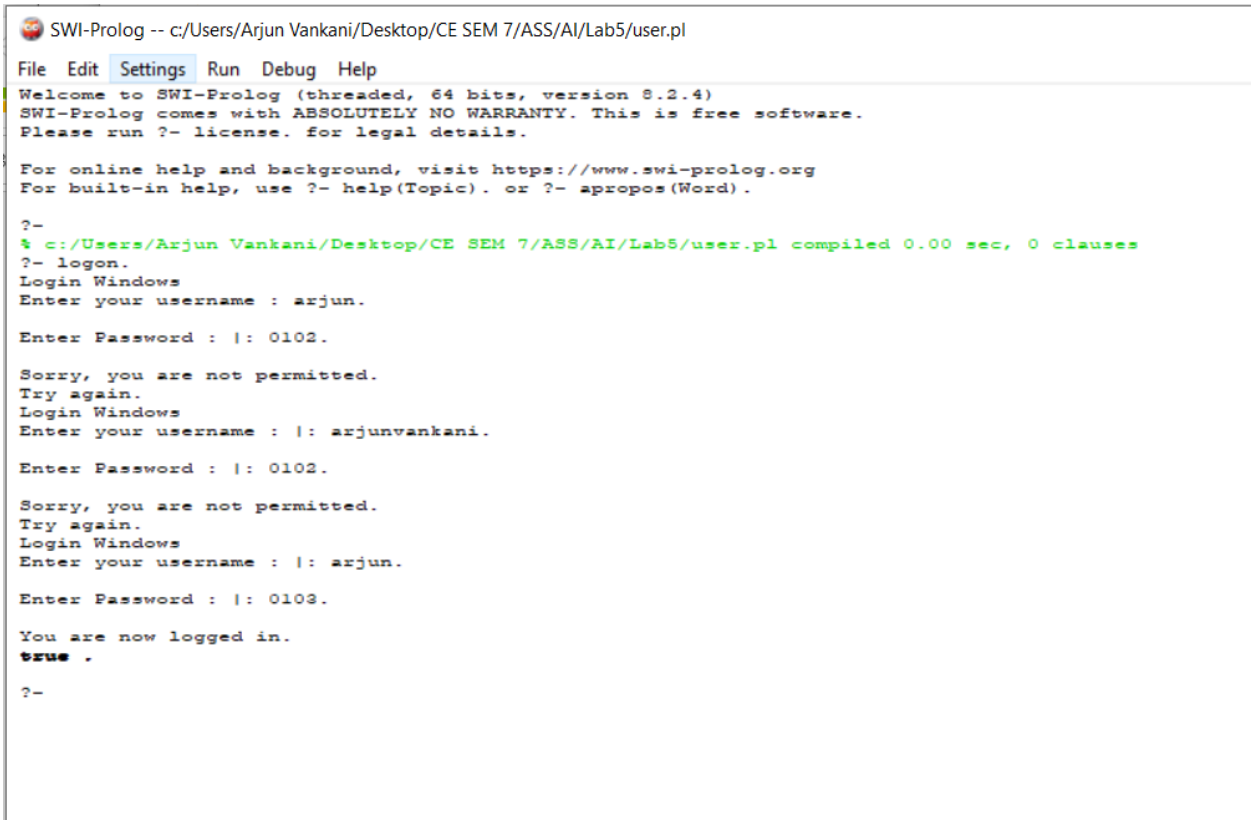
➢

**Code in Prolog:**

```
Domains
        Name, password = symbol
Predicates
        getinput,
        logon,
        user(name,password)
Clauses

        logon :- getinput,
              write('You are logged in.'),nl.

        logon :- repeat,
              write('Sorry, you are not permitted.'),nl,
              write('Try again.'),nl,
              getinput,
              write('You are now logged in.').
```

```
getinput :- write('Login Windows'),nl,
            write('Enter your username : '),
        read(Name),nl,
        write('Enter Password : '),
        read(Password),nl,
        user(Name, Password).
user(arjun,0103).
```

## Output:



## Practical-6: Write a PROLOG program to implement Tower of Hanoi Problem.

➢

### Code in Prolog:

### Domains

POLE = symbol

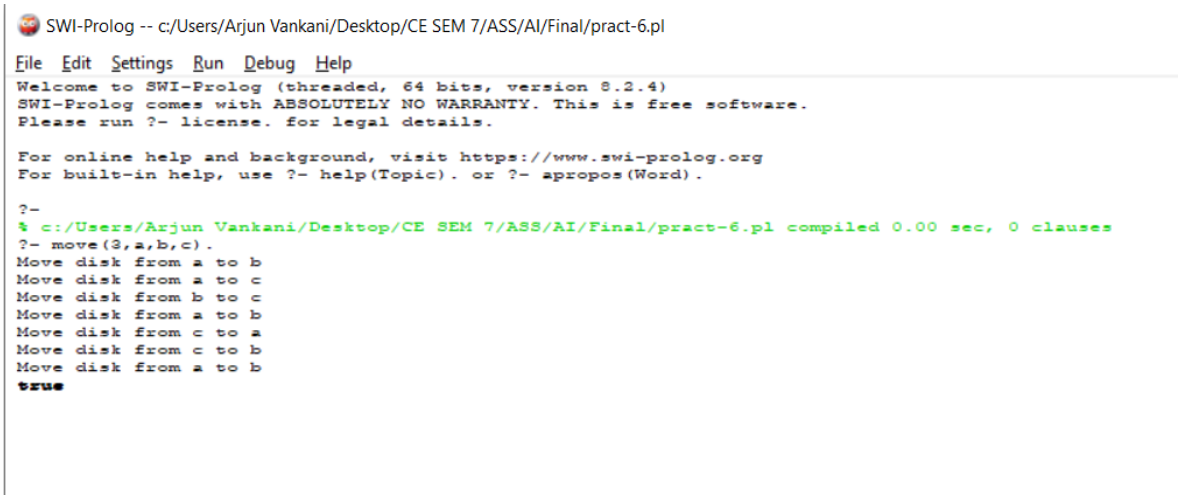
### Predicates

Move (INTEGER, POLE, POLE, POLE)

### Clauses

```
move(1,X,Y,_):-write('Move disk from '),write(X),write(' to'),write(Y),nl.

move(N,X,Y,Z):-N>1,M is N-1,
    move(M,X,Z,Y),
    move(1,X,Y,_),
    move(M,Z,Y,X).
```

### Output:



## Practical-7: Write a PROLOG program to calculate the roots of quadratic equation Consider all possibilities real, equal, imaginary

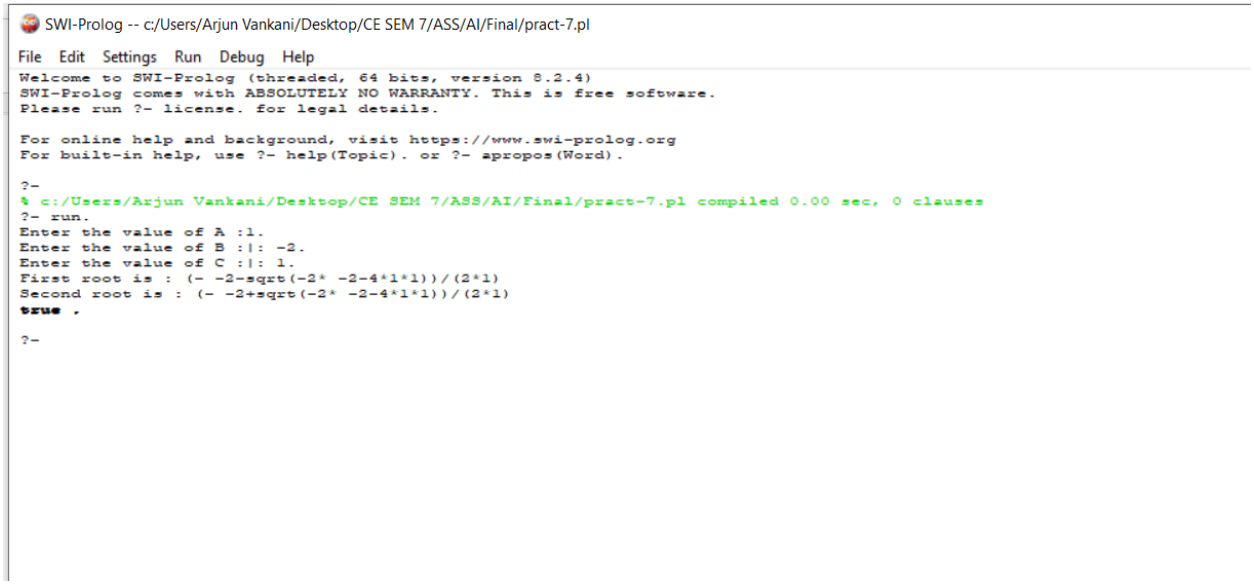
➢

**Code in Prolog:**

```
Domains

Predicates

        root(real,real,real,real).
        Run.

Clauses

        run:-

                write("Enter the value of A :" ),

           read(A),

                write("Enter the value of B :" ),

                read(B),

                write("Enter the value of C :" ),

                read(C),

                D = (B*B)-(4*A*C),

                root(A,B,C,D).


        root(A,B,C,D):-

                A=0.0,
```

```
    write("Only one root exists."),
    ANS = (-C/B),
    write(ANS);
    D>=0,
    ANS = (-B - sqrt(D)) / (2*A),
    ANS1 = (-B + sqrt(D)) / (2*A),
write("First root is : "),
    write(ANS),nl,
    write("Second root is : "),
write(ANS1);
    REAL= (-B) / (2*A),
    IMG = sqrt(-D) / (2*A),
    write("Real root is : "),
    write(REAL),nl,
    write("Imaginary root is : "),
    write(IMG).
```

## Output:


SWI-Prolog -- c:/Users/Arjun Vankani/Desktop/CE SEM 7/ASS/AI/Final/pract-7.pl
File Edit Settings Run Debug Help
Welcome to SWI-Prolog (threaded, 64 bits, version 8.2.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.
For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).
?-
% c:/Users/Arjun Vankani/Desktop/CE SEM 7/ASS/AI/Final/pract-7.pl compiled 0.00 sec, 0 clauses
?- run.
Enter the value of A :1.
Enter the value of B :|: -2.
Enter the value of C :|: 1.
First root is : (- -2-sqrt(-2* -2-4*1*1))/(2*1)
Second root is : (- -2+sqrt(-2* -2-4*1*1))/(2*1)
true .
?-

## Practical-8: Write a PROLOG program to solve Water-Jug Problem.

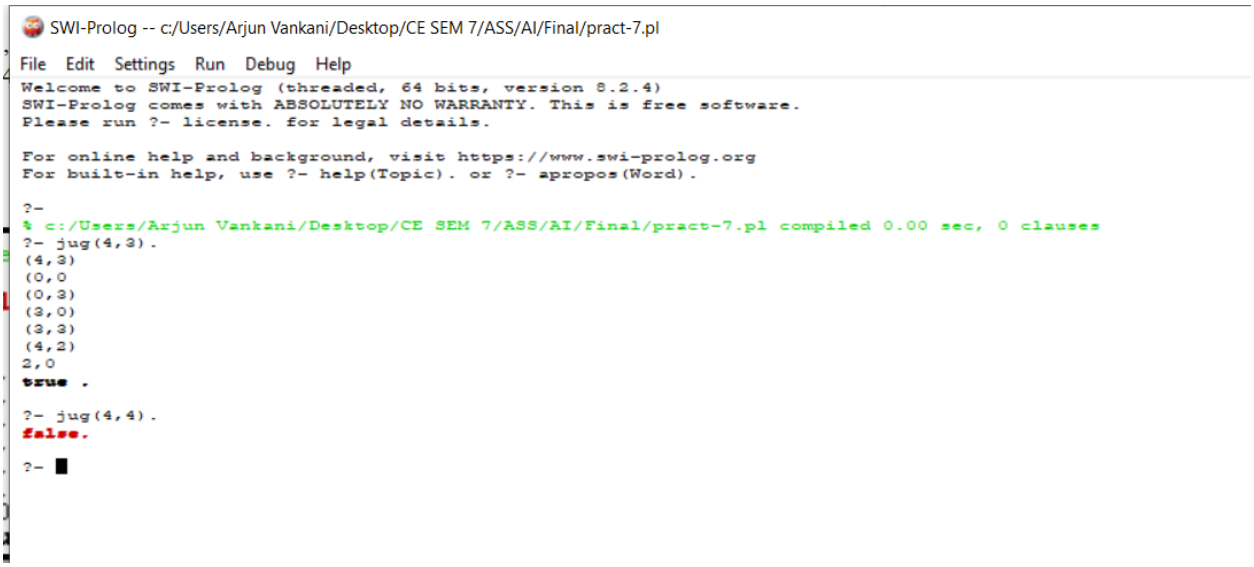
➢

**Code in Prolog:**

```
Domains

Predicates

        jug(INTRGER, INTRGER)


Clauses

        jug(2, _).
        jug(0,2):-
           write('(0,2)'),nl,
           write('(2,0)'),nl.
        jug(4,0) :-
           write('(4,0)'),nl,
           jug(0,0).
        jug(4,3) :-
           write('(4,3)'),nl,
           jug(0,0).
        jug(3,0) :-
           write('(3,0)'),nl,
```

```
    jug(3,3).
jug(X,0) :-
    write('('),write(X),write(',0'),nl,
    jug(0,3).
jug(0,3) :-
    write('(0,3)'),nl,
    jug(3,0).
jug(0,X) :-
    write('(0,'),write(X),write(')'),nl,
    jug(0,0).
jug(3,3) :-
    write('(3,3)'),nl,
    jug(4,2).
jug(4,2) :-
    write('(4,2)'),nl, write('2,0'), nl,
    jug(2,0).
jug(X, Y) :-
    X>4,fail,Y>3,fail.
```

## Output:


SWI-Prolog -- c:/Users/Arjun Vankani/Desktop/CE SEM 7/ASS/AI/Final/pract-7.pl
File Edit Settings Run Debug Help
Welcome to SWI-Prolog (threaded, 64 bits, version 8.2.4)
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Please run ?- license. for legal details.
For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).
?-
% c:/Users/Arjun Vankani/Desktop/CE SEM 7/ASS/AI/Final/pract-7.pl compiled 0.00 sec, 0 clauses
?- jug(4,3).
(4,3)
(0,0
(0,3)
(3,0)
(3,3)
(4,2)
2,0
true .
?- jug(4,4).
false.
?-

## Practical-9: Implement Breadth first search algorithms in choice of your language.

➢

**Code in Prolog:**

```
Domains

Predicates

Clauses

    s(a, b).

    s(a, c).

    s(b, g).

    s(b, f).

    s(c, r).

    s(c, e).

    goal(f).

    solve( Start, Solution) :-

    breadthfirst( [ [Start] ], Solution).

    breadthfirst( [ [Node | Path] |_], [Node | Path] ) :-

    goal( Node).

    breadthfirst( [ [N | Path] | Paths], Solution) :-

    bagof([M,N|Path],

    ( s( N, M), \+ member( M, [N | Path] ) ), NewPaths),
```

```
%conc( Paths, NewPaths, Pathsl), !,
append(Paths, NewPaths, Pathsl), !,
breadthfirst( Pathsl, Solution);
breadthfirst( Paths, Solution).
```

## Output:

- **Practical-10: Implement Depth first search and breadth first search algorithms in choice of your language.**

➢

**Code in Prolog:**

**Domains**

**Predicates**

**Clauses**

```
connected(1,7,1).
connected(1,8,1).
connected(1,3,1).
connected(7,4,1).
connected(7,20,1).
connected(7,17,1).
connected(8,6,1).
connected(3,9,1).
connected(3,12,1).
connected(9,19,1).
connected(4,42,1).
connected(20,28,1).
connected(17,10,1).

connected2(X,Y,D) :- connected(X,Y,D).
```

```
connected2(X,Y,D) :- connected(Y,X,D).


next_node(Current, Next, Path) :-
   connected2(Current, Next, _),
not(member(Next, Path)).
depth_first(Goal, Goal, _, [Goal]).
depth_first(Start, Goal, Visited, [Start|Path]) :-
next_node(Start, Next_node, Visited),
write(Visited), nl,
depth_first(Next_node, Goal, [Next_node|Visited], Path).
```

## Output: