KIET Group of Institutions, Ghaziabad

Department of Computer Applications

(An ISO – 9001: 2015 Certified & 'A' Grade accredited Institution by NAAC)

Artificial Intelligence Lab

KCA 351: Session 2021-22

Experiment – No-1

Problem Statement : **A Water Jug Problem: You are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 gallons of water in the 4-gallon jug?**

Algorithm:

Production Rules : State Process

Rule 1 : (X,Y | X<4) (4 ,Y) {Fill 4−gallon jug}

Rule 2 : (X,Y |Y<3) (X,3) {Fill 3−gallon jug}

Rule 3 : (X,Y |X>0) (0 ,Y) {Empty 4−gallon jug}

Rule 4 : (X,Y | Y>0) (X,0) {Empty 3−gallon jug}

Rule 5 : (X,Y | X+Y>=4 ˆ Y>0) (4 ,Y−(4−X)) {Pour water from 3−gallon jug into 4−gallon jug until 4−gallon jug is full}

Rule 6 : (X,Y | X+Y>=3 ˆX>0) (X−(3−Y) ,3) {Pour water from 4−gallon jug into 3−gallon jug until 3−gallon jug is full}

Rule 7 : (X,Y | X+Y<=4 ˆY>0) (X+Y,0) {Pour all water from 3−gallon jug into 4−gallon jug}

Rule 8 : (X,Y | X+Y <=3ˆ X>0) (0 ,X+Y) {Pour all water from 4−gallon jug into 3−gallon jug}

Rule 9 : (0 ,2) (2 ,0) {Pour 2 gallon water from 3 gallon jug into 4 gallon jug}

Program:

```
x , y=  0 , 0

m , n = 4 , 3

print("Initial State: (0,0)")

print("Capacities: (4,3)")

print("Goal State: (2,y)")

while( x!= 2):

   r = int(input("Enter rule: "))

   if r==1 :

      x = m

   elif r==2 :

      y = n

   elif r==3 :

      x = 0

   elif r==4 :

      y = 0

   elif r==5 :

      t = n-y

      y = n

      x -= t

   elif r==6 :

      t = m-x

      x = m

      y -= t
```

```
elif r==7 :
    y += x
    x = 0
elif r==8 :
    x += y
    y = 0
print(x,y)
```

Output :

```
Initial State: (0,0)
Capacities: (4,3)
Goal State: (2,y)
Enter rule: 1
4 0
Enter rule: 5
1 3
Enter rule: 4
1 0
Enter rule: 7
0 1
Enter rule: 1
4 1
Enter rule: 5
2 3
```