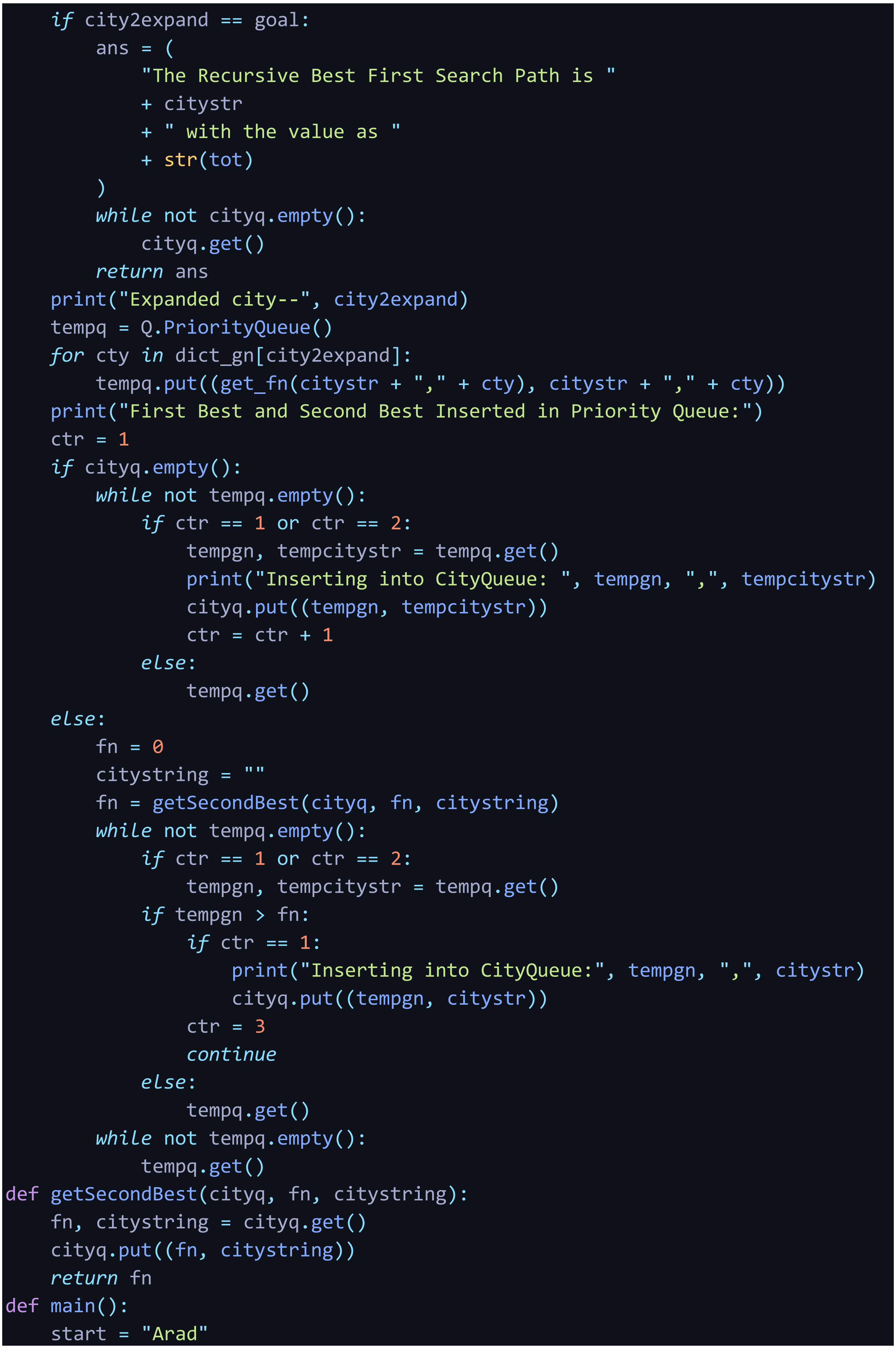
# PRACTICAL 4

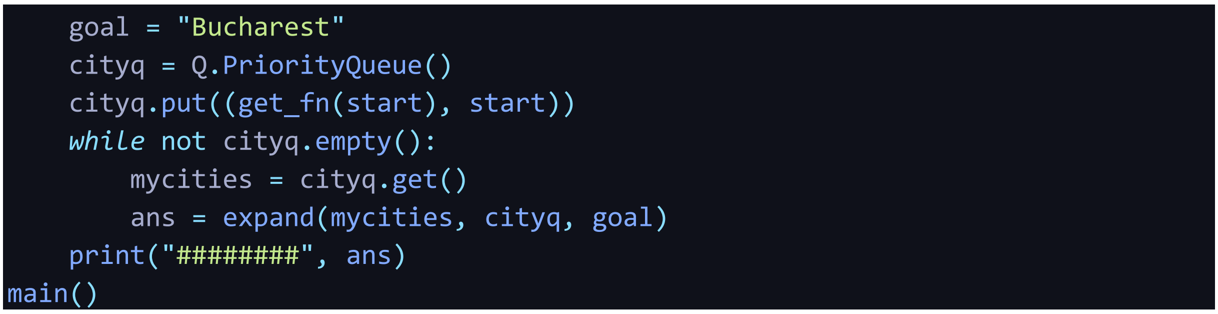
Aim: To implement RBFS Algorithm.

Code:

```
import queue as Q
dict_hn = {"Arad": 336, "Bucharest": 0, "Craiova": 160, "Drobeta": 242,
"Eforie": 161, "Fagaras": 176, "Giurgiu": 77, "Hirsova": 151, "lasi": 226,
"Lugoj": 244, "Mehadia": 241,
           "Neamt": 234, "Oradea": 380, "Pitesti": 100, "Rimnicu": 193,
"Sibiu": 253, "Timisoara": 329, "Urzicem": 80, "Vastu": 199, "Zerind": 374}
dict_gn = dict(
    Arad=dict(Zerind=75, Timisoara=118, Sibiu=140),
    Bucharest=dict(Urziceni=85, Fagaras=211, Giurgiu=90, Pitesti=101),
    Craiova=dict(Drobeta=120, Rimnicu=146, Pitesti=138),
    Drobeta=dict(Mehadia=75, Craiova=120),
    Eforie=dict(Hirsova=86),
    Fagaras=dict(Sibiu=99, Bucharest=211),
    Giurgi=dict(Bucharest=90),
    Hirsova=dict(Urziceni=98, Eforie=86),
    lasi=dict(Vaslui=92, Neamt=87),
    Lugoj=dict(Timisoara=111, Mehadia=70),
    Mehadia=dict(Lugoj=70, Drobeta=75),
    Neamt=dict(lasi=87),
    Oradea=dict(Zerind=71, Sibiu=151),
    Pitesti=dict(Rimnicu=97, Craiova=138, Bucharest=101),
    Rimnicu=dict(Sibiu=80, Pitesti=97, Craiova=146),
    Sibiu=dict(Fagaras=99, Rimnicu=80, Oradea=151, Arad=140),
    Timisoara=dict(Arad=118, Lugoj=111),
    Urziceni=dict(Hirsova=98, Bucharest=85, Vaslui=142),
    Vaslui=dict(lasi=92, Urziceni=142),
    Zerind=dict(Arad=75, Oradea=71),
)
def get_fn(citystr):
    cities = citystr.split(",")
    hn = 0
    gn = 0
    ctr = 0
    while ctr != len(cities) - 1:
        gn = gn + dict_gn[cities[ctr]][cities[ctr + 1]]
        ctr = ctr + 1
    hn = dict_hn[cities[len(cities) - 1]]
    return hn + gn
def expand(mycities, cityq, goal):
    tot, citystr = mycities
    cities = citystr.split(",")
    city2expand = cities[len(cities) - 1]
```

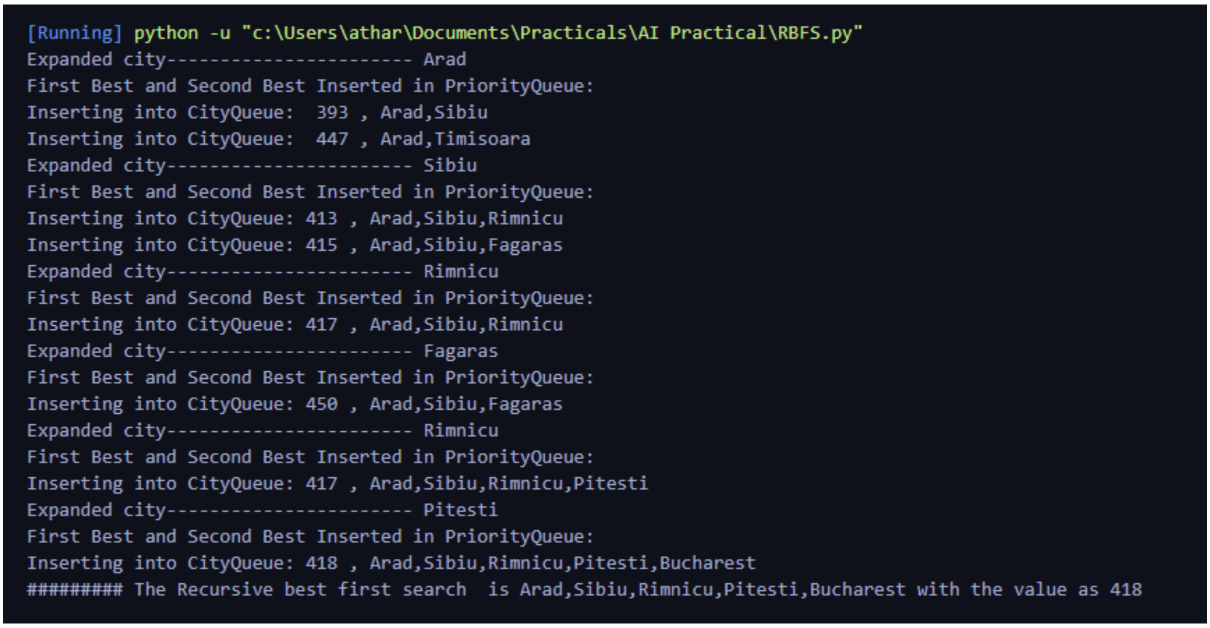


```
    if city2expand == goal:
        ans = (
            "The Recursive Best First Search Path is "
            + citystr
            + " with the value as "
            + str(tot)
        )
        while not cityq.empty():
            cityq.get()
        return ans
    print("Expanded city--", city2expand)
    tempq = Q.PriorityQueue()
    for cty in dict_gn[city2expand]:
        tempq.put((get_fn(citystr + "," + cty), citystr + "," + cty))
    print("First Best and Second Best Inserted in Priority Queue:")
    ctr = 1
    if cityq.empty():
        while not tempq.empty():
            if ctr == 1 or ctr == 2:
                tempgn, tempcitystr = tempq.get()
                print("Inserting into CityQueue: ", tempgn, ",", tempcitystr)
                cityq.put((tempgn, tempcitystr))
                ctr = ctr + 1
            else:
                tempq.get()
    else:
        fn = 0
        citystring = ""
        fn = getSecondBest(cityq, fn, citystring)
        while not tempq.empty():
            if ctr == 1 or ctr == 2:
                tempgn, tempcitystr = tempq.get()
            if tempgn > fn:
                if ctr == 1:
                    print("Inserting into CityQueue:", tempgn, ",", citystr)
                    cityq.put((tempgn, citystr))
                ctr = 3
                continue
            else:
                tempq.get()
        while not tempq.empty():
            tempq.get()
def getSecondBest(cityq, fn, citystring):
    fn, citystring = cityq.get()
    cityq.put((fn, citystring))
    return fn
def main():
    start = "Arad"
```



```
    goal = "Bucharest"
    cityq = Q.PriorityQueue()
    cityq.put((get_fn(start), start))
    while not cityq.empty():
        mycities = cityq.get()
        ans = expand(mycities, cityq, goal)
    print("########", ans)
main()
```

Output:



```
[Running] python -u "c:\Users\athar\Documents\Practicals\AI Practical\RBFS.py"
Expanded city----------------------- Arad
First Best and Second Best Inserted in PriorityQueue:
Inserting into CityQueue:  393 , Arad,Sibiu
Inserting into CityQueue:  447 , Arad,Timisoara
Expanded city----------------------- Sibiu
First Best and Second Best Inserted in PriorityQueue:
Inserting into CityQueue: 413 , Arad,Sibiu,Rimnicu
Inserting into CityQueue: 415 , Arad,Sibiu,Fagaras
Expanded city----------------------- Rimnicu
First Best and Second Best Inserted in PriorityQueue:
Inserting into CityQueue: 417 , Arad,Sibiu,Rimnicu
Expanded city----------------------- Fagaras
First Best and Second Best Inserted in PriorityQueue:
Inserting into CityQueue: 450 , Arad,Sibiu,Fagaras
Expanded city----------------------- Rimnicu
First Best and Second Best Inserted in PriorityQueue:
Inserting into CityQueue: 417 , Arad,Sibiu,Rimnicu,Pitesti
Expanded city----------------------- Pitesti
First Best and Second Best Inserted in PriorityQueue:
Inserting into CityQueue: 418 , Arad,Sibiu,Rimnicu,Pitesti,Bucharest
######## The Recursive best first search  is Arad,Sibiu,Rimnicu,Pitesti,Bucharest with the value as 418
```