```python
import numpy as num

graph = {
    'a' : ['b','c','d'],
    'b' : ['d'],
    'c' : ['a','d'],
    'd' : ['a','c']
}

iterationNo = 7

print("Graph")
print(graph)

# print(graph['b'].count('a'))

A = []

for i in graph.keys():
    a = []
    for j in graph.keys():
        if(graph[j].count(i)!=0):
            a.append(1/len(graph[j]))
        else:
            a.append(0)
    A.append(a)
print("Page rank Matrix")
for i in A:
    for j in i:
        print(j,' ',end=" "),
    print('')

B = []

for i in range(0,len(A)):
    B.append([1])
print("Iteration Table")
print("Iteration 1:\n")
print(B)

for i in range(0,iterationNo):
    B = num.matmul(A,B)
    print("\nIteration " + str(i+2) + ":\n")
    print(B)
```

```
Graph
{'a': ['b', 'c', 'd'], 'b': ['d'], 'c': ['a', 'd'], 'd': ['a', 'c']}
Page rank Matrix
0   0   0.5   0.5
0.3333333333333333   0   0   0
0.3333333333333333   0   0   0.5
0.3333333333333333   1.0   0.5   0
Iteration Table
Iteration 1:

[[1], [1], [1], [1]]

Iteration 2:

[[1.        ]
 [0.33333333]
 [0.83333333]
 [1.83333333]]

Iteration 3:

[[1.33333333]
 [0.33333333]
 [1.25      ]
 [1.08333333]]

Iteration 4:

[[1.16666667]
 [0.44444444]
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Iteration 6:

[[1.20833333]
 [0.39814815]
 [1.06134259]
 [1.33217593]]

Iteration 7:

[[1.19675926]
 [0.40277778]
 [1.06886574]
 [1.33159722]]

Iteration 8:

[[1.20023148]
 [0.39891975]
 [1.06471836]
 [1.3361304 ]]
PS C:\Users\Prajwal Dhule\Desktop\Assignments\Sem_5_assignments\DWM>
```
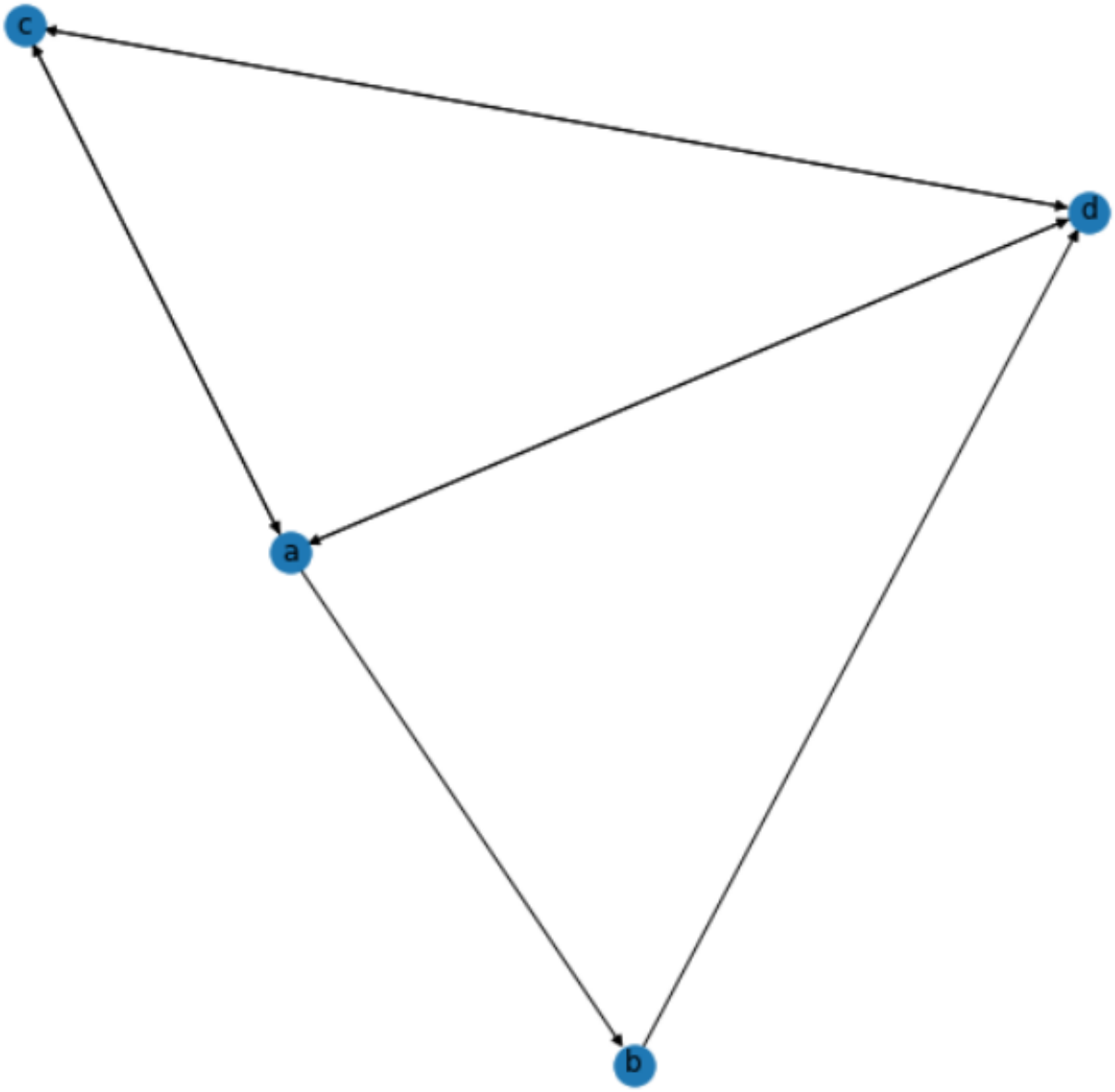

Graph:


c
d
a
b