VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Programme	:	**B.Tech**	Semester	:	**Win Sem 21-22**
Course	:	**Web Mining Lab**	Code	:	**CSE3024**
Faculty	:	**Dr.Bhuvaneswari A**	Slot	:	**L7+L8**
Date	:	**19-03-2022**	Marks	:	**10 Points**

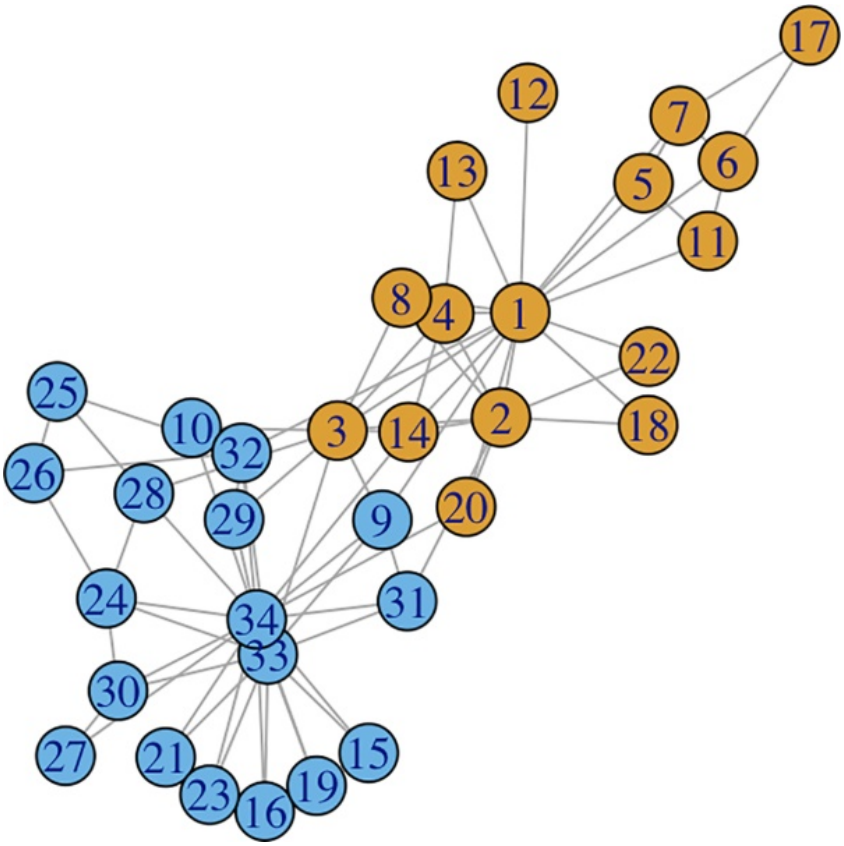
NAME; Vaibhav Agarwal
REGISTER No: 19BCE1413

Exercise 10: GIRVAN-NEWMAN ALGORITHM

- NetworkX package Implementation (5 Marks)
- Custom Implementation (5 Marks)

Implement the Girvan-Newman algorithm for the detection and analysis of community structure for the following network graph datasets (a) and (b).

a. Zachary karate club network dataset (refer folder A for networkX package implementation) 5 Marks



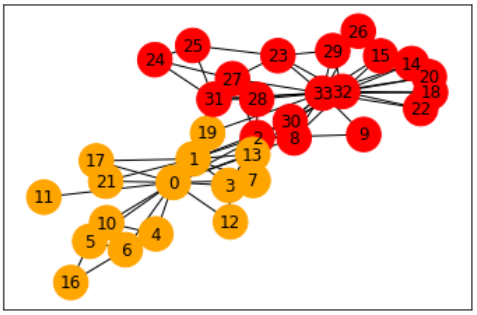
CODE:

```
import matplotlib.pyplot as plt
import networkx as nx
from networkx.algorithms.community.centrality import girvan_newman
G = nx.karate_club_graph()
nx.draw(G, with_labels=True)
 ommunities = girvan_newman(G)
node_groups = []
for com in next(communities):
node_groups.append(list(com))

for i in range(len(node_groups)):
print("Community",(i+1),":", node_groups[i])
color_map = []
for node in G:
if node in node_groups[0]:
color_map.append('orange')
else:
color_map.append('red')
graph = nx.draw_networkx(G,node_size=600,node_color=color_map)
plt.show()
```

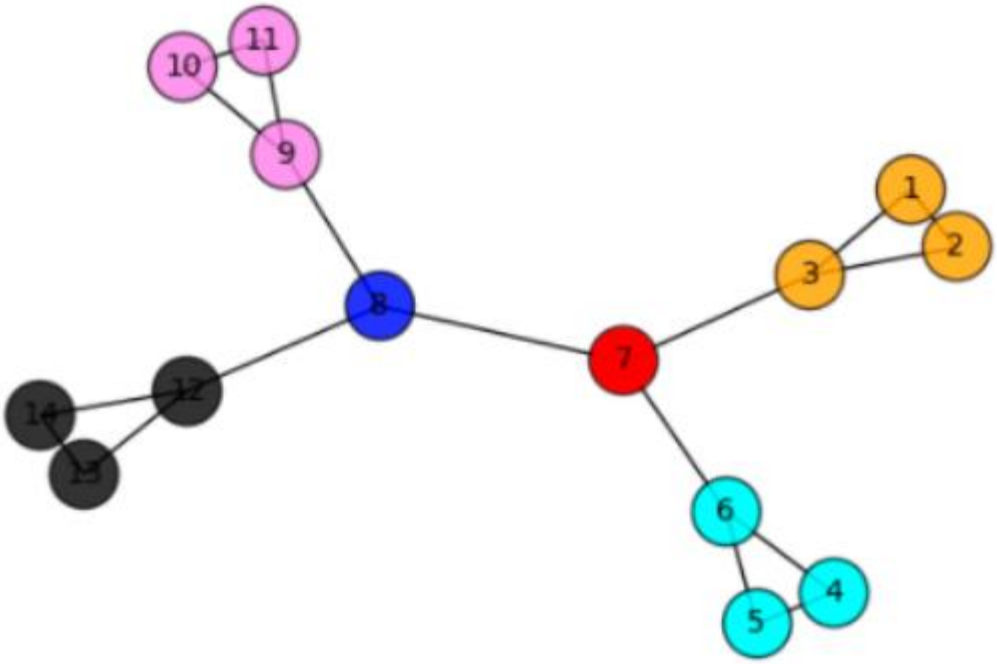
OUTPUT:

```
communities = girvan_newman(G)
node_groups = []
for com in next(communities):
  node_groups.append(list(com))

for i in range(len(node_groups)):
  print("Community",(i+1),":", node_groups[i])
  color_map = []
  for node in G:
      if node in node_groups[0]:
          color_map.append('orange')
      else:
          color_map.append('red')
graph = nx.draw_networkx(G,node_size=600,node_color=color_map)
plt.show()
```

```
Community 1 : [0, 1, 3, 4, 5, 6, 7, 10, 11, 12, 13, 16, 17, 19, 21]
Community 2 : [2, 8, 9, 14, 15, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33]
```



b. Facebook Friend Connection network dataset (refer folder B for custom implementation



CODE:

```
import community.community_louvain as c
import networkx as nx
import matplotlib.pyplot as plt
import sys
import pylab
import copy

pylab.show()

def removeEdges(G):
remove = []
```

```
b = nx.edge_betweenness_centrality(G)
max_betweenness = b[max(b,key=b.get)]
for k,v in b.items():
if v==max_betweenness:
remove.append(k)
G.remove_edges_from(remove)
graphs = list(nx.connected_components(G))

d={}
counter = 0
for graph in graphs:
counter+=1
for node in graph:
d[node]=counter

if G.number_of_edges() == 0:
return [list(nx.connected_components(G)),0,G]

m = c.modularity(d,G)
return [list(nx.connected_components(G)),m,G]

if __name__=="__main__":

result_communities=[]
G = nx.read_edgelist("input.txt")
copyGraph = copy.deepcopy(G)
d={}
for node in G:
d[node]=0
initial_modularity = c.modularity(d, G)
result_communities.append([d,initial_modularity,G])

while G.number_of_edges()>0:
subgraphs = removeEdges(G)
result_communities.append(subgraphs)
G=subgraphs[-1]
for step in result_communities:
if step[1]>initial_modularity:
ng=step[0]
result=[]
modularity=step[1]
for graph in step[0]:
result.append(sorted([int(vertex) for vertex in graph]))

for community in result:
print(community)

d={};counter=0
for graph in ng:
for node in graph:
d[node] = counter
counter+=1
```

```
pos=nx.spring_layout(copyGraph)
colors = ["violet","black","orange","cyan","red","blue","green","yellow","indigo","pink"]
for i in range(len(ng)):
graph=ng[i]
nlist = [node for node in graph]
nx.draw_networkx_nodes(copyGraph,pos,nodelist=nlist,node_color=colors[i%10],node_size=500,alp
ha=0.8)

nx.draw_networkx_edges(copyGraph,pos)
nx.draw_networkx_labels(copyGraph,pos,font_size=10)
plt.axis('off'
```

OUTPUT:

```
[1, 2, 3]
[7]
[4, 5, 6]
[8]
[9, 10, 11]
[12, 13, 14]
```