**Practical 3: Compute the following node level measures: (i) Density; (ii) Degree; (iii) Reciprocity; (iv) Transitivity; (v) Centralization; (vi) Clustering.**

Code:

# Load the igraph library

library(igraph)

# Create a graph object 'g'

g <- graph.formula(1-2, 1-3, 2-3, 2-4, 3-5, 4-5, 4-6,4-7, 5-6, 6-7)

# Density

# Number of vertices

vcount(g)

# Number of edges

ecount(g)

# Density of the graph

ecount(g) / (vcount(g) \* (vcount(g) - 1) / 2)

# Degree

degree(g)

# Reciprocity:

# Create a directed graph 'dg'

dg <- graph.formula(1-+2, 1-+3, 2++3)

# Plot the directed graph 'dg'

plot(dg)

# Reciprocity of the directed graph 'dg'

reciprocity(dg)

# Formula for reciprocity

(2 \* dyad.census(dg)$mut / ecount(dg))

# Transitivity

# Create a famous graph 'kite'

kite <- graph.famous("Krackhardt\_Kite")

# Find the adjacent triangles in the 'kite' graph

atri <- adjacent.triangles(kite)

# Plot the 'kite' graph with vertex labels as adjacent triangles

plot(kite, vertex.label = atri)

# Local transitivity of the directed graph 'dg'

transitivity(dg, type = "local")

# Proportion of adjacent triangles to all possible triangles in the 'kite' graph

adjacent.triangles(kite) / (degree(kite) \* (degree(kite) - 1) / 2)

# Centralization

# Degree of centrality

centralization.degree(g, mode = "in", normalized = T)

# Closeness Centralization

closeness(g)

centralization.closeness(g, mode = "all", normalized = TRUE)

# Betweeness Centrality

betweenness(g, directed = T, weights = NA)

edge.betweenness(g, directed = T, weights = NA)

centralization.betweenness(g, directed = T, normalized = T)

# Eigenvector centrality

centralization.evcent(g, directed = T, normalized = T)

# Clustering

# Create two graphs 'g1' and 'g2'

g2 <- barabasi.game(50, p = 2, directed = F)

g1 <- watts.strogatz.game(1, size = 100, nei = 5, p = 0.05)

# Combine the two graphs 'g1' and 'g2'

g <- graph.union(g1, g2)

# Simplify the combined graph 'g'

g <- simplify(g)

# Plot the simplified graph 'g'

plot(g)

**OUTPUT**

