Resit Assignment 2
Networks and Graphs

Deadline: May 25, 18:00

Please submit your answers using Canvas
Attach ONE .pdf file with your name(s), VUnet ID(s), homework group number and of course answers!

1   Trees (25%)

Definition 1 A tree in which every node has either 0 or 2 children is a *binary tree.*
Prove that every binary tree has an odd number of vertices.

2   Trees. Routing in communication networks (30%)

Use *Kruskal's algorithm* to find the minimum weight spanning tree of the undirected graph
$G1$. What is the weight of this spanning tree?
Describe the procedures as well as the final solution.
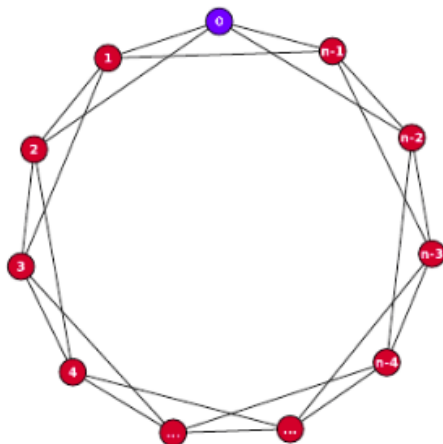
Figure 1: Undirected graph, $G1$
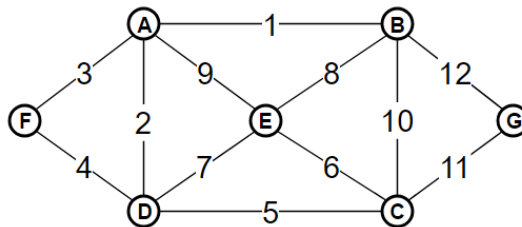
3   Network analysis (25%)

Consider the Harary graphs $H_{4,n}$, for all $n \geq 7$. Compute for any vertex v in $H_{4,n}$ the
following metrics:

(a) the eccentricity $\varepsilon(v)$

(b) the clustering coefficient $cc(v)$

(c) the number of triples at v $n_\Lambda(v)$

(d) the closeness $c_C(v)$

Hint: When computing the metrics for a vertex v, consider the following illustration:

Figure 2: Harary graphs, $H_{4,n}$

4   Random networks (20%)

(a) Let v be the first new vertex to be connected to a $BA(n, n_0, m)$ graph that consists of n_0 vertices. What is the expected clustering coefficient of the vertex v?

(b) What is the average path length of a $BA(n, n_0, m)$ graph with n vertices?