CSC 641 Network Science, Fall 2019
**Exam 3 (Take Home: Due: Oct. 24, 2019: 7.30 PM)**   **Total: 100 pts**

Hardcopy (Neatly written or typed), due in Class

Each question is worth 20 pts

1) HITS
Rank the vertices of the following graph using the HITS algorithm. Find the Authority Scores and Hub
Scores of the vertices. Also, if the directed graph has bi-directional edges between two vertices u and v,
determine which of the two directed edges (u -> v and v -> u) dominate.
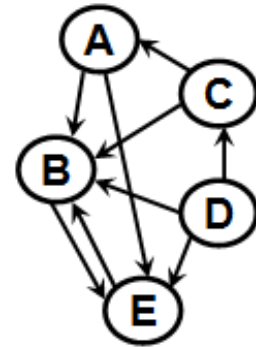Proceed for four iterations or you could stop if the values converge earlier.
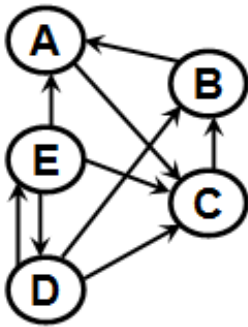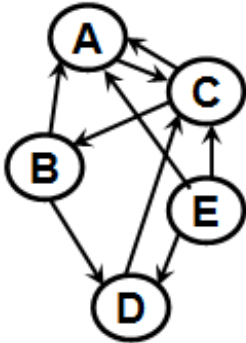

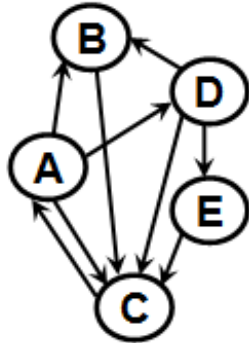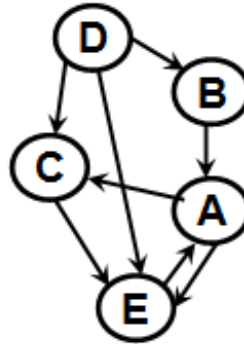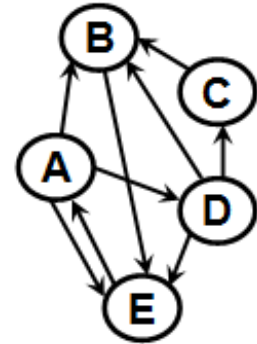Champion, Jeremy   Deanes, Marcus   Evans, Rashad   Gammons, Allee
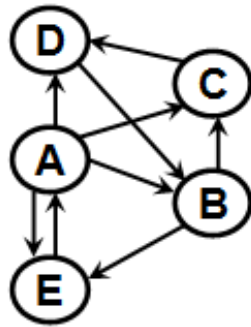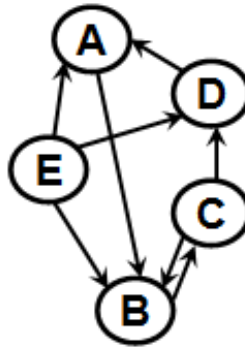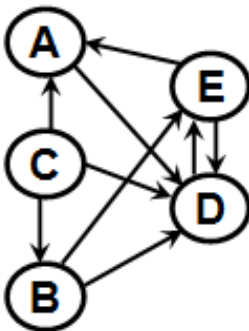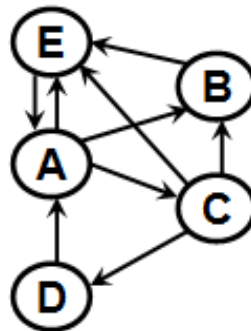

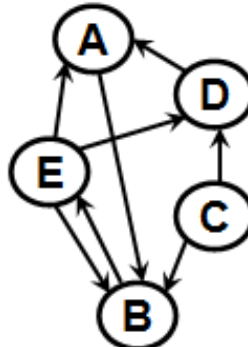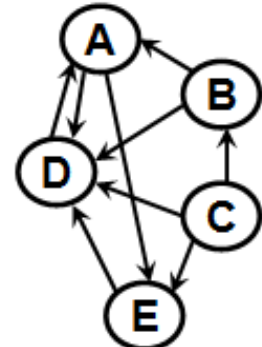Jones, Qunicy   Lewis, Devario   Maduka, Chidiebere   Ukpebor, Augustine

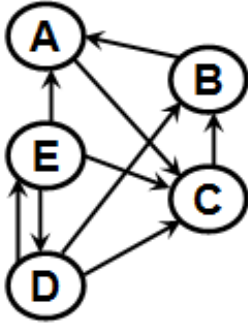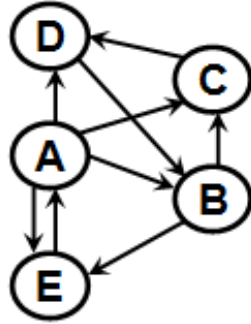Valliappan, Vallimanalan   Xu, Ran   Zhang, Xuecen   Gebre, Amanuel
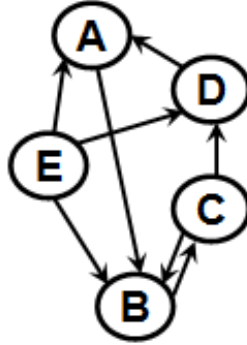
2) Page Rank
Find the Page Rank scores of the vertices for the directed graph assigned to you. Write the Page Rank formulation for each vertex and show the results of the iterations (calculated in Excel) until the values converge to the first decimal (or up to 10 iterations).
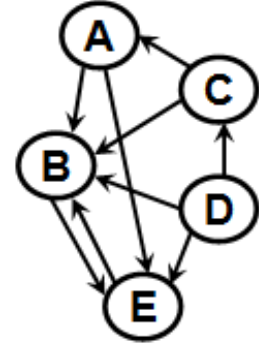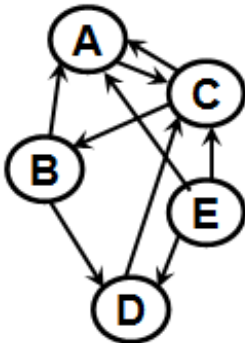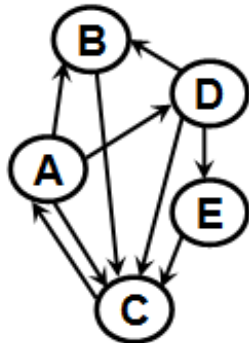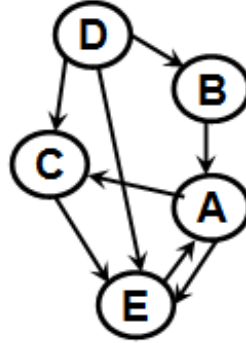

Champion, Jeremy
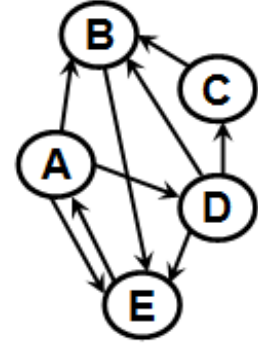

Deanes, Marcus

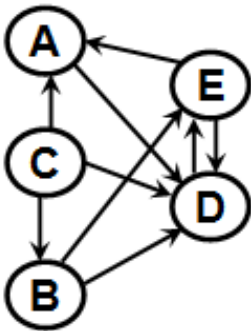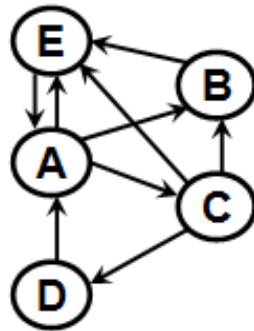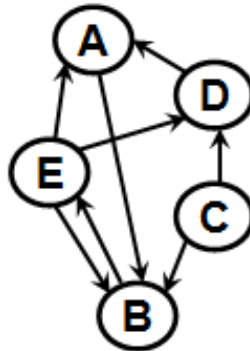Evans, Rashad

Gammons, Allee

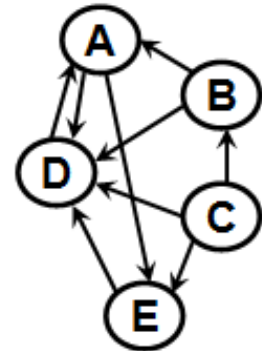Jones, Qunicy

Lewis, Devario

Maduka, Chidiebere

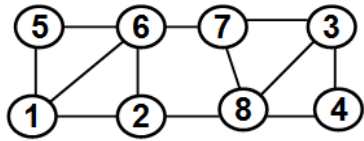
Ukpebor, Augustine
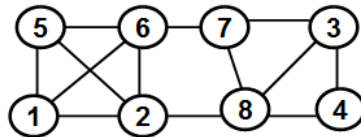

Valliappan, Vallimanalan
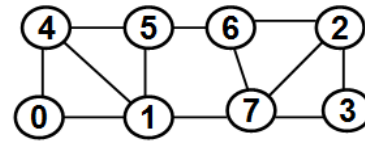

Xu, Ran

Zhang, Xuecen

Gebre, Amanuel

3) Given a graph below, run the complete linkage clustering algorithm to determine a modular partitioning of the graph into communities.
(a) Show the entire hierarchy
(b) Run the pairwise modularity program to compute the modularity of each of your clusters and prune the branches of the hierarchy and determine the modularity score of the final partition.
(c) Determine the internal and external densities of each of the communities of the final partition.
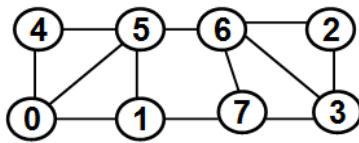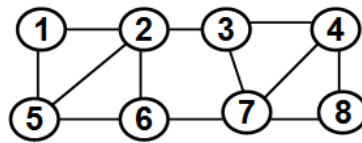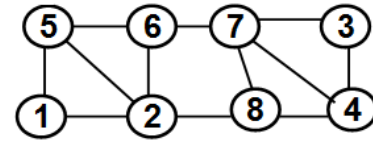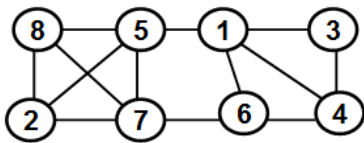
Champion, Jeremy
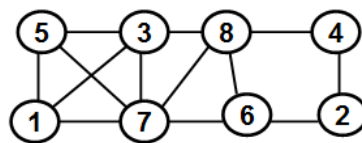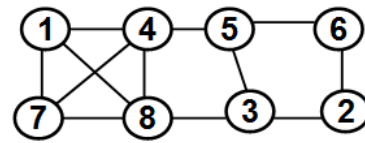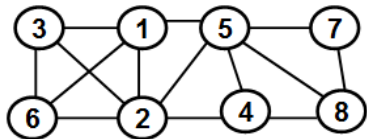
Deanes, Marcus

Evans, Rashad
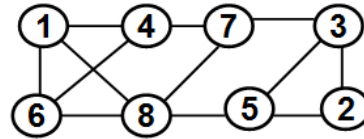
Gammons, Allee

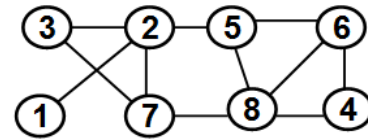Jones, Quincy

Lewis, Devario

Maduka, Chidiebere

Ukpebor, Augustine
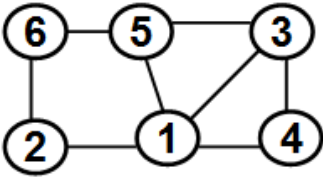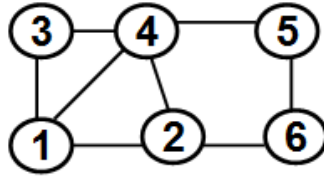
Valliappan, Vallimanalan

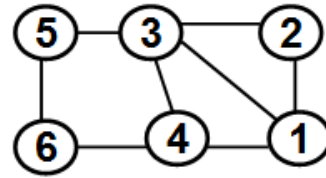Xu, Ran

Zhang, Xuecen

Gebre, Amanuel Engeda

4) Run the BFS algorithm to determine the **betweenness of the edges** in the graphs assigned to you.
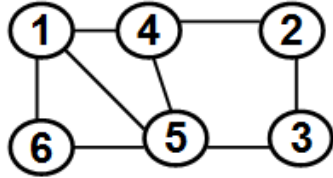Show in detail all the work [Note: You should NOT use the software to compute the edge betweenness]
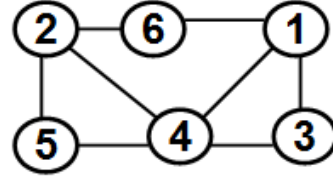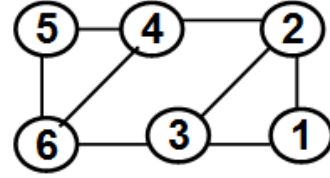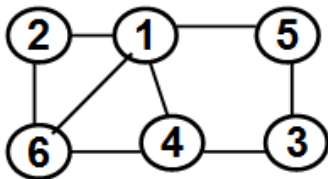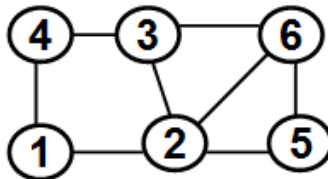
Champion, Jeremy

Deanes, Marcus
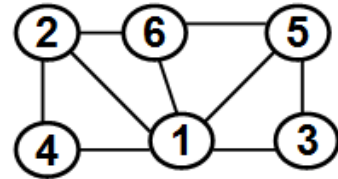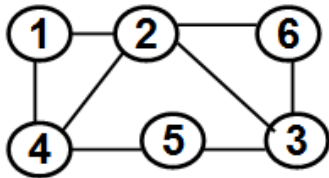
Evans, Rashad

Gammons, Allee
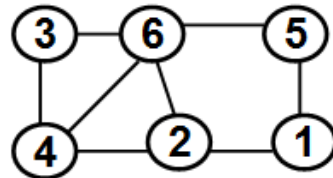
Jones, Qunicy

Lewis, Devario
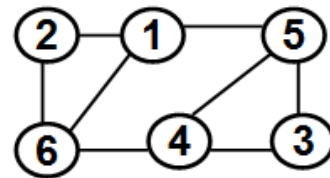
Maduka, Chidiebere

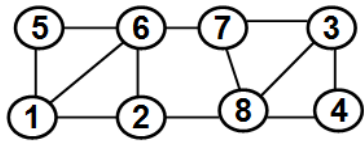Ukpebor, Augustine

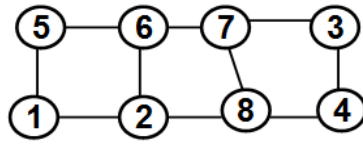Valliappan, Vallimanalan

Xu, Ran

Zhang, Xuecen

Gebre, Amanuel Engeda

5) Run the Girvan Newman community detection algorithm based on Edge betweenness to determine a partitioning of the graph into communities.
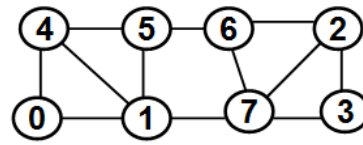
Determine the modularity score for each of the communities and the total modularity score. Also, draw the partitioning hierarchy and indicate the modularity score of the partitions/communities.
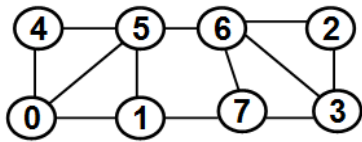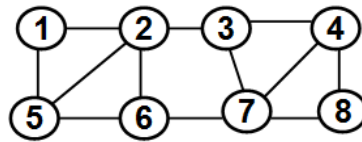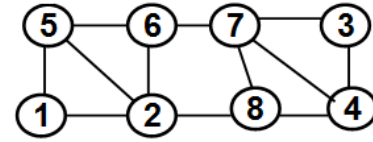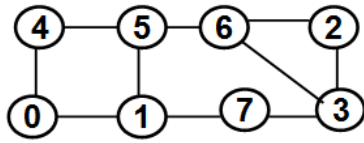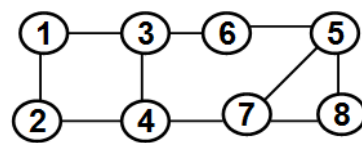
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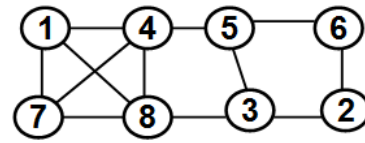
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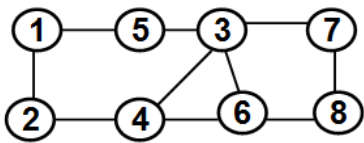
Gammons, Allee

Jones, Quincy
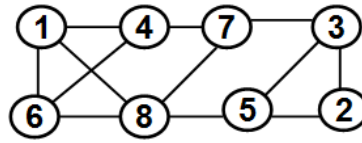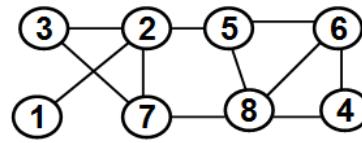
Lewis, Devario

Maduka, Chidiebere

Ukpebor, Augustine

Valliappan, Vallimanalan

Xu, Ran

Zhang, Xuecen

Gebre, Amanuel Engeda