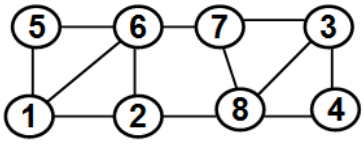
CSC 641 Network Science, Fall 2019
Exam 4 (Take Home: Due: Nov. 7th, 2019: 7.30 PM) **Total: 100 pts**

Hardcopy (Neatly written or typed), due in Class

Q1: 25 pts) 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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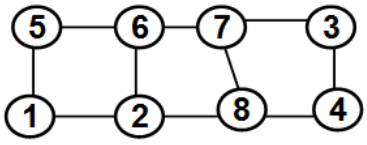

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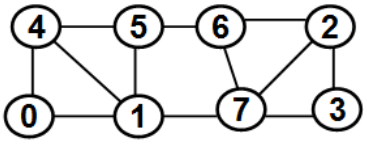

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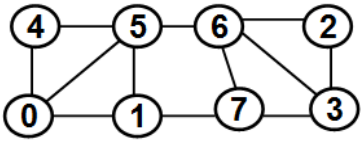
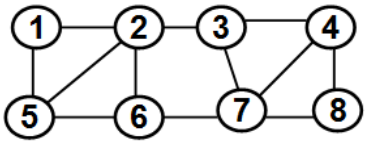


Gammons, Allee



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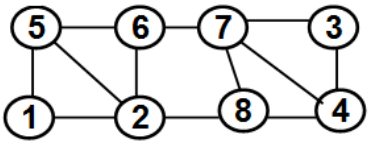

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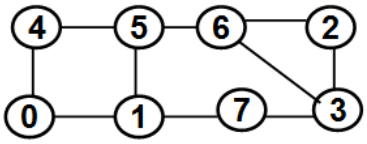

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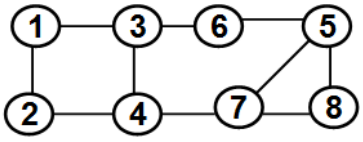

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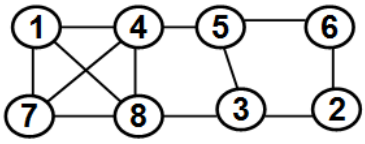
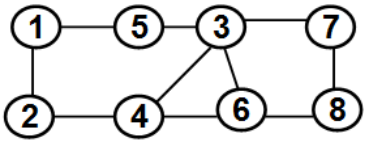


Valliappan, Vallimanalan



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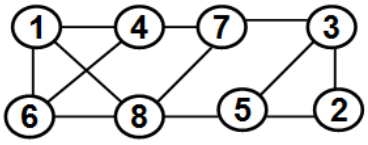

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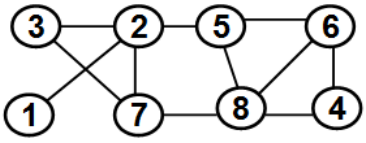
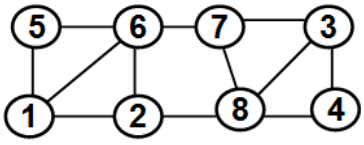


Gebre, Amanuel Engeda

Q2: 30 pts) (a) Determine the threshold NOVER score (minimum NOVER score) that would guarantee the satisfaction of the ***strong triadic closure*** property for the edges in the following graph.
(b) Using the threshold NOVER score determined, identify the strong and weak ties.
(c) Determine a partitioning of the graph into communities based on the strong/weak ties identified.
(d) 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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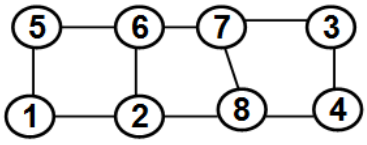

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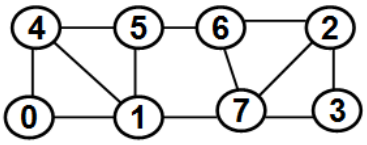

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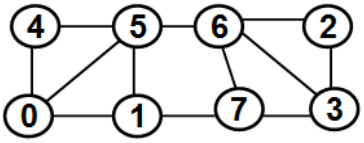

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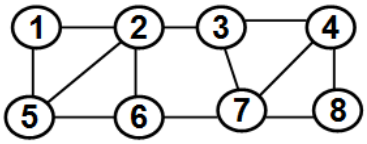

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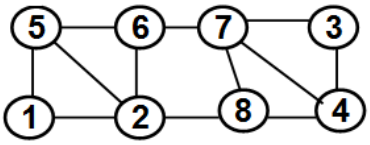

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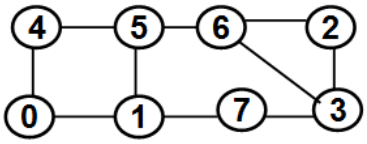

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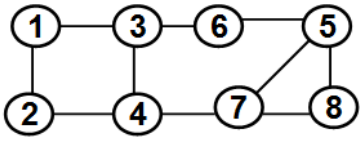

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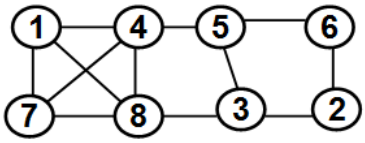

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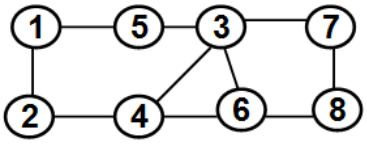

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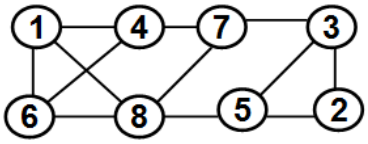

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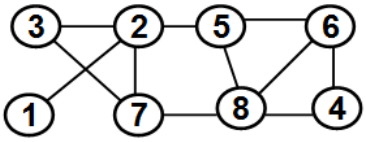

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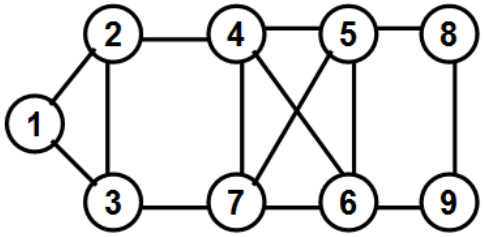
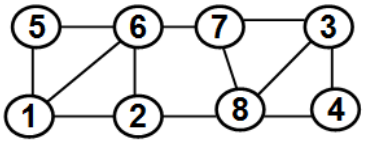
Q3 - 15 pts) Consider the graph shown below. If nodes 1, 2, 3 are of type A; nodes 4, 5, 6, 7 are of type B and nodes 8, 9 are of type C, determine whether or not the following types of nodes exist together as one community or separate communities: (i) A and B, (ii) A and C, (iii) B and C. Show all the work.



Q4 - 30 pts) Consider the given real-world network:

a) Generate an ER-random network (with the same number of nodes as the real-world network) whose average degree is approximately the same as that of the real-world network.
b) Determine the Randomness index of the real-world network and the ER-random network of (a).

Show all your steps and work.



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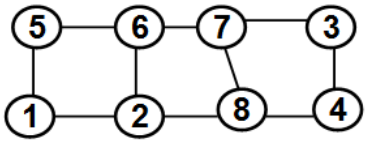

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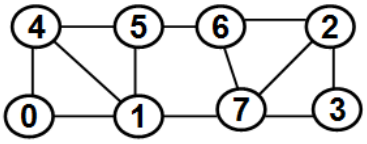

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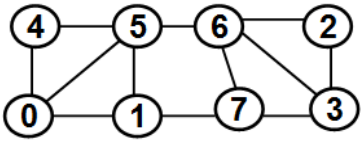

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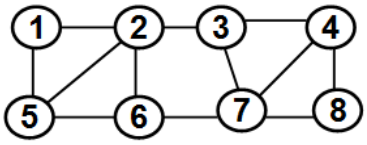

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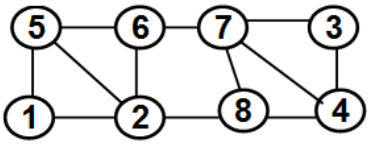

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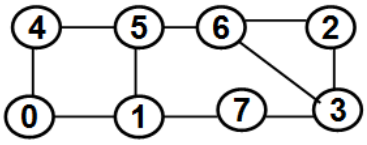

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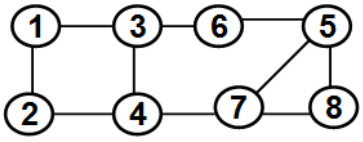

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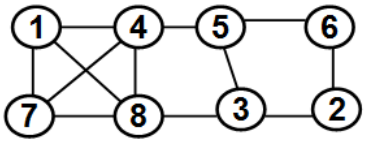

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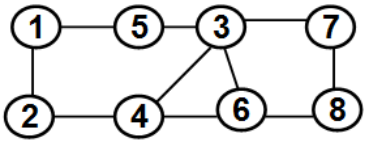

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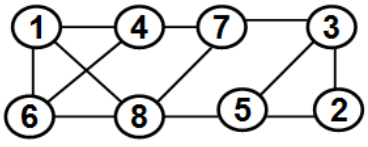

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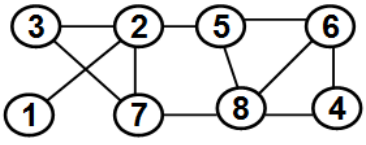

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