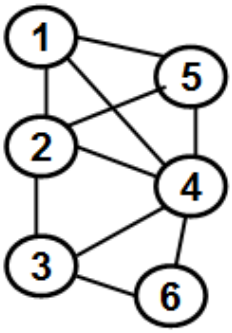
Student Name: _____ J#: _____

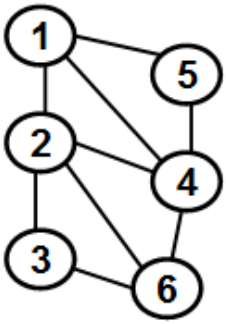
CSC 641 Network Science, Fall 2018
Exam 2 (Take Home: Due: Oct. 9th, 2018: 7.30 PM) Total: 100 pts

Print this Exam, Insert your answer sheets in between the questions and submit the final exam with all papers stapled.

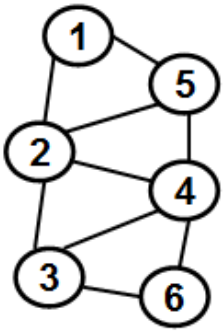
1) **(35 pts)** For the graph given below:
(c - 5 pts) Determine the spectral radius ratio for node degree.
(e - 10 pts) Determine the algebraic connectivity of the graph.
(f - 10 pts) Determine the Estrada index for protein folding for the graph assigned to you as well as determine the folding effectiveness.
(h - 10 pts) Determine the bipartivity index of the graph, the two partitions and identify the frustrated edges, if any.



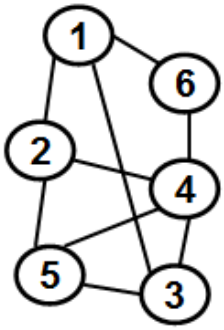
Dave, Hitanshu



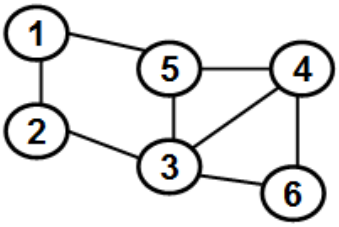
Davis, Carolyn



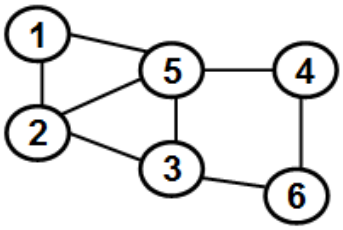
Evans, Rashad



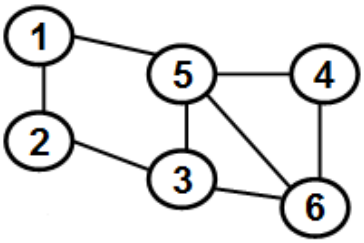
Faris, Amanuel



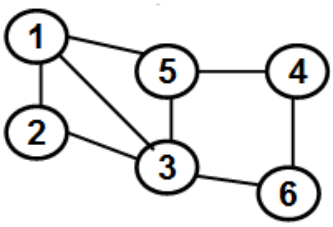
Fiesha, Temesgen



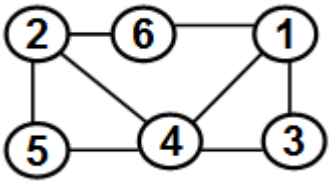
Ramos, Ciji



Sarker, Md Imran



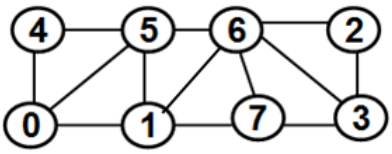
Tutika, Raj



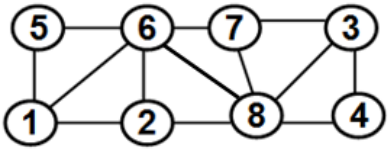
Whitfield, Nicholas

Student Name: _____ J#: _____

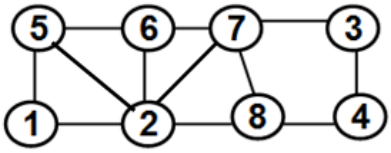
2) **(25 pts)** Determine the best possible partitioning of the graph (assigned to you) to communities using the Eigenvector approach discussed in Module 2. Show the partition hierarchy and the modularity scores of the partitions in the hierarchy, including the modularity score for the entire graph considered as a singly community. Show all the work.



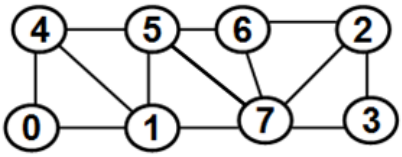
Dave, Hitanshu



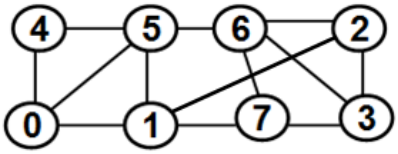
Davis, Carolyn



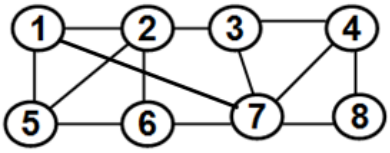
Evans, Rashad



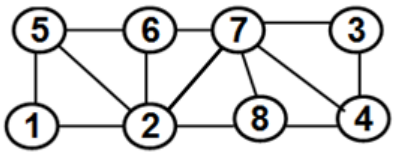
Fiesha, Temesgen



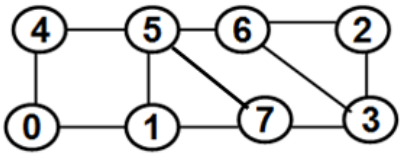
Ramos, Ciji



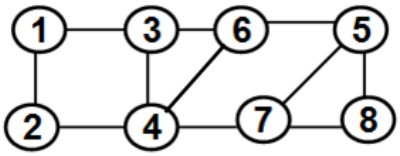
Sarker, Md Imran



Tutika, Raj



Whitfield, Nicholas



Faris, Amanuel

Student Name: _____ J#: _____

3) **(15 pts)** You are given the adjacency lists of three graphs: original graph and graphs A and B. One of the two graphs (A or B) is isomorphic to the original graph. Using the spectral analysis approach discussed in Module 2, determine which of these two graphs (A or B) is isomorphic to the original graph as well as extract the mapping of the vertices between the original graph and its isomorphic graph. Show all the work, including all the intermediate results.

Original Graph	
1	2
1	6
1	7
1	8
2	7
2	8
3	5
3	6
3	7
4	5
4	6
4	7
4	8
5	7
5	8
7	8

Graph A	
5	8
7	8
1	7
2	7
1	5
2	5
3	6
3	8
1	3
4	6
4	8
1	4
2	4
1	6
2	6
1	2

Graph B	
5	7
7	8
1	7
2	7
1	5
2	5
3	6
3	8
1	3
4	6
4	8
1	4
2	4
1	6
2	6
1	2

Dave, Hitanshu

Original Graph	
1	3
1	4
1	7
1	8
2	3
2	4
2	5
3	4
3	5
3	6
4	5
4	8
5	6
5	8
6	7

Graph A	
5	6
6	8
3	6
2	6
5	7
7	8
4	7
5	8
4	5
1	5
4	8
2	8
1	4
2	4
1	3

Graph B	
5	6
6	7
3	6
2	6
5	7
7	8
4	7
5	8
4	5
1	5
4	8
2	8
1	4
2	4
1	3

Davis, Carolyn

Original Graph	
1	4
1	5
1	7
2	6
2	7
2	8
3	7
3	8
4	5
4	6
4	7
5	6
5	8
6	7
6	8

Graph A	
6	7
2	7
1	7
4	7
1	4
3	4
1	5
3	5
2	6
6	8
1	6
2	8
2	3
1	8
3	8

Graph B	
6	7
2	7
1	7
4	8
1	4
3	4
1	5
3	5
2	6
6	8
1	6
2	8
2	3
1	8
3	8

Evans, Rashad

Original Graph	
1	2
1	3
1	4
1	6
1	7
2	3
2	4
2	6
2	8
3	6
3	7
4	6
4	7
4	8
5	6
6	7

Graph A	
5	6
3	6
6	7
2	6
1	6
3	5
5	7
2	5
4	5
2	3
1	3
2	7
1	7
4	7
2	8
1	2

Graph B	
5	6
3	6
6	8
2	6
1	6
3	5
5	7
2	5
4	5
2	3
1	3
2	7
1	7
4	7
2	8
1	2

Fiesha, Temesgen

Student Name: _____ J#: _____

Original Graph	
1	3
1	4
2	3
2	5
3	5
3	6
3	7
4	5
4	6
5	6
5	7
5	8

Graph A	
7	8
3	8
2	7
1	2
1	7
6	8
5	7
1	3
3	6
1	6
1	5
1	4

Graph B	
7	8
3	8
2	7
1	2
1	7
6	7
5	7
1	3
3	6
1	6
1	5
1	4

Ramos, Ciji

Original Graph	
1	3
1	4
1	5
1	6
1	7
2	6
2	8
3	6
4	6
5	7
5	8
6	7

Graph A	
2	7
5	7
1	7
4	7
6	7
4	8
3	8
2	4
4	5
1	6
1	3
4	6

Graph B	
2	8
5	7
1	7
4	7
6	7
4	8
3	8
2	4
4	5
1	6
1	3
4	6

Sarker, Md Imran

Original Graph	
1	3
1	5
1	8
2	7
2	8
3	5
3	6
3	8
4	5
4	6
5	6
5	7

Graph A	
2	3
2	4
2	5
7	8
6	7
3	4
3	5
3	6
1	4
1	5
4	5
4	8

Graph B	
2	3
2	4
2	6
7	8
6	7
3	4
3	5
3	6
1	4
1	5
4	5
4	8

Tutika, Raj

Original Graph	
1	2
1	3
1	5
1	7
2	3
2	4
2	8
3	4
3	5
3	6
3	7
4	5
5	6
6	7

Graph A	
1	4
4	6
2	4
4	7
1	6
1	3
1	5
3	6
2	6
6	8
6	7
2	3
2	8
7	8

Graph B	
1	4
4	5
2	4
4	7
1	6
1	3
1	5
3	6
2	6
6	8
6	7
2	3
2	8
7	8

Whitfield, Nicholas

Original Graph	
1	2
1	3
1	5
1	7
2	3
2	5
2	8
3	5
3	6
3	7
4	6
4	7
4	8
5	6
6	7
6	8

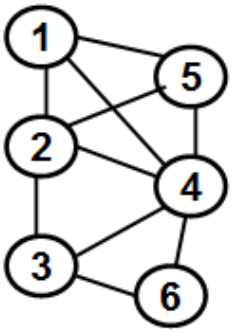
Graph A	
1	2
1	5
1	4
1	8
2	5
2	4
2	6
4	5
5	8
3	7
3	8
3	6
4	7
7	8
6	8

Graph B	
1	2
1	5
1	4
1	8
2	5
2	4
2	6
4	5
5	8
3	7
3	8
3	6
4	7
7	8
6	7

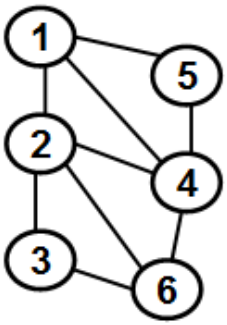
Faris, Amanuel

Student Name: _____ J#: _____

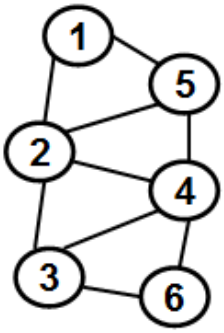
4) **(25 pts)** Determine the Eigenvector Centrality of the vertices (using the Power-Iteration method) in the graph assigned to you. Show all the work for four iterations.



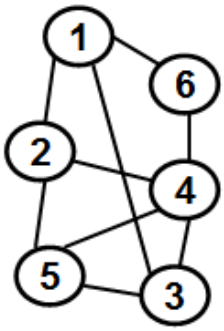
Dave, Hitanshu



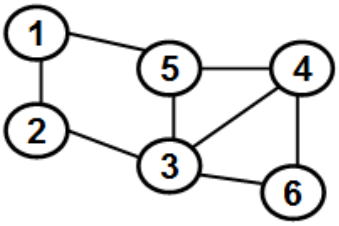
Davis, Carolyn



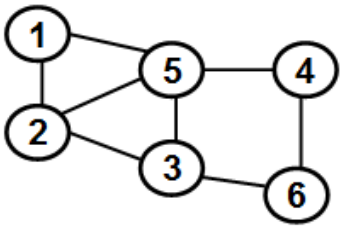
Evans, Rashad



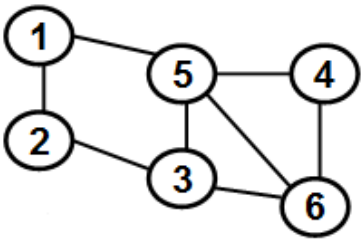
Faris, Amanuel



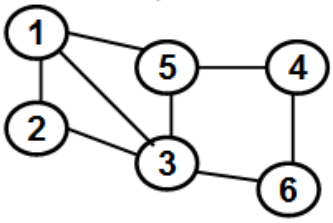
Fiesha, Temesgen



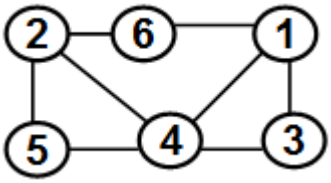
Ramos, Ciji



Sarker, Md Imran



Tutika, Raj



Whitfield, Nicholas