

Student Name: \_\_\_\_\_

J#: \_\_\_\_\_

**CSC 641 Network Science, Fall 2015**  
**Instructor: Dr. Natarajan Meghanathan**

**Take Home Exam 1 (Due: October 12, 2015, 6 PM)**

**Max. Points: 100**

**Late submission (Oct. 12, 2015-6:10 PM to Oct. 13, 2015-6 PM: -25 points, taken off from your score)**

**Late submission (Oct. 13, 2015-6:01 PM to Oct. 14, 2015-6 PM: -50 points, taken off from your score)**

**No late submission allowed after Oct. 14, 2015-6 PM.**

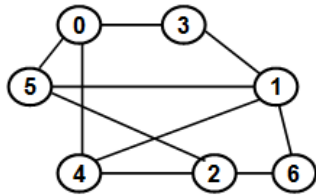
Use additional sheets as necessary. Clearly indicate your name and J# in each of the additional sheets.

1) (10, 10, 10 pts) Determine each of the following for the graphs assigned to you.

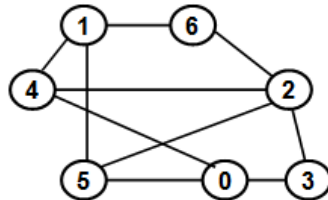
a) Assortativity Index

b) Articulation Points (using Depth First Search)

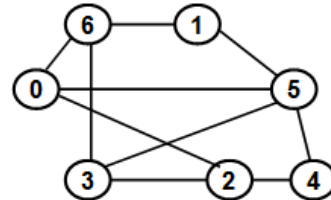
c) Estrada Index for Protein Folding (using the Eigenvalue/Eigenvector-approach - use the Java program for eigenvector centrality that was given to you or you could use the website at: [http://www.arndt-bruenner.de/mathe/scripts/engl\\_eigenwert.htm](http://www.arndt-bruenner.de/mathe/scripts/engl_eigenwert.htm))



Karthik Reddy



Anirudh Reddy



Yashwanth Divanji

Student Name: \_\_\_\_\_

J#: \_\_\_\_\_

2) (3, 8, 8, 8, 8 pts) For the graph assigned to you below, determine the ranking of the vertices according to each of the following centrality measures. Also, determine the Centralization value for the entire graph based on the individual centrality values of the nodes.

- i) Degree Centrality
- ii) Eigenvector Centrality
- iii) Closeness Centrality
- iv) Farness Centrality
- v) Sub graph Centrality

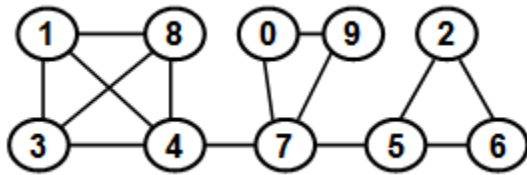
For (ii), (iv) and (v) - use the Java program for eigenvector centrality that was given to you or you could use the website at: [http://www.arndt-bruenner.de/mathe/scripts/engl\\_eigenwert.htm](http://www.arndt-bruenner.de/mathe/scripts/engl_eigenwert.htm)

(8 pts) Compute the number of shortest paths that go through a particular vertex as indicated

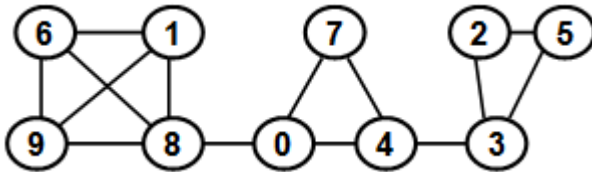
Karthik Reddy - # of shortest paths from vertex 1 to 2 that go through vertex 9

Anirudh Reddy - # of shortest paths from vertex 7 to 6 that go through vertex 5

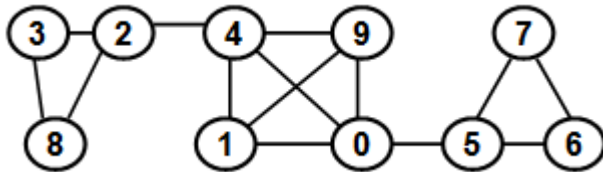
Yashwanth Divanji - # of shortest paths from vertex 7 to 4 that go through vertex 2



Karthik Reddy



Anirudh Reddy

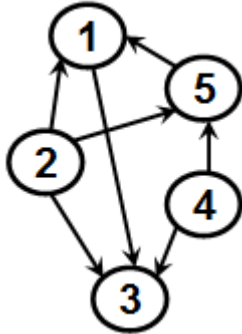


Yashwanth Divanji

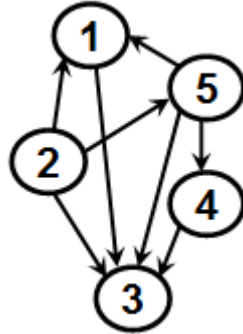
Student Name: \_\_\_\_\_

J#: \_\_\_\_\_

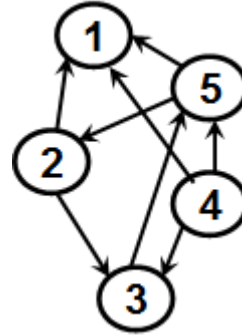
- 3) (i & ii - 15 pts; iii - 20 pts) Determine a ranking of the vertices in the graph assigned to you based on:
- (i) Authority scores
  - (ii) Hub scores. For (i) and (ii) use the HITS algorithm. Show all the work.
  - (iii) Page Rank. Show all the work.



Karthik Reddy



Anirudh Reddy



Yashwanth Divanji