

The LNM Institute of Information Technology  
Department of Computer Science & Engineering  
CSE 3132 Social Network Analysis  
Exam Type: Mid Term

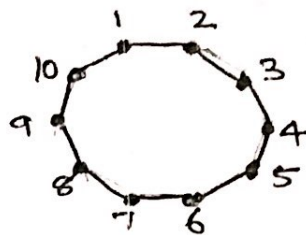
Time: 90 min

28/02/2019

Max. Marks: 35

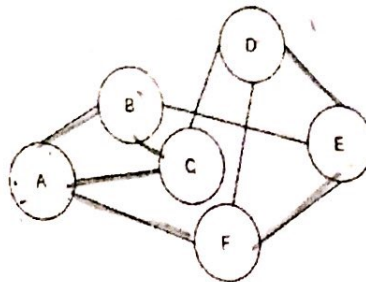
Answer all questions in the same order as it appears in the question paper. If there are any assumptions to be made for your answer write clearly the assumption that you are making before answering. Only if the assumption is reasonable it will be considered. No doubt clarifications in the examination hall! All the best!

✓ Consider the undirected graph  $G$  given below:



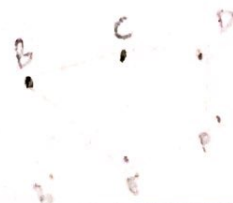
- ✓ (a) What is the diameter of the graph  $G$ ? (1)
- ✓ (b)  $G$  given above is a cycle graph with 10 vertices. What will be the diameter for a general cycle graph  $G'$  over  $n$  vertices, where  $n \geq 1$ ? Give reasoning. (1)
- ✓ (c) If the general graph  $G'$  is a directed graph and cycle is in clock-wise direction. What will be the diameter of the graph  $G'$ ? (1)

2. Consider the graph  $G$  given below:



Classify the following sequence of vertices to say if they are a walk, trail, path, Eulerian circuit, or Hamiltonian circuit (choose the best possible choice). (3)

- (a) ABEFD  
(b) ABCBEFDC  
(c) BCDFEB  
(d) ABEFDCA



All the best!

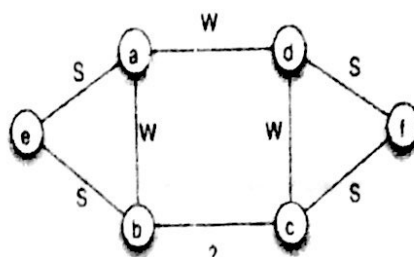
(e) ABCABC

(f) ABCAFED

3. Pick the correct answer(s) and justify why each of the choice(s) are / is correct or incorrect. Assume that the network that we are considering is huge (You need to explain for all choices why they are true or false to get full marks) (3)

- (a) The degree distribution in a Random Network is Poisson
- (b) The degree distribution in a Random Network is Binomial
- (c) The degree distribution in a Random Network is not Poisson
- (d) The degree distribution in a Random Network is not Binomial

4. Consider the graph given below, in which each edge - except the edge connecting  $b$  and  $c$  - is labeled as a strong tie (S) or a weak tie (W). According to the theory of strong and weak ties, with the strong triadic closure assumption, how would you expect the edge connecting  $b$  and  $c$  to be labeled? Give a brief (1-3 sentence) explanation for your answer (5)



5. Calculate the Jaccard structural equivalence of all pair of vertices in a cycle graph (undirected) containing 5 vertices. Which vertices have similarity? Generalize for any cycle graph of  $n$  vertices. (5)
6. Given an example of a connected graph  $G = (V, E)$  that has local clustering coefficient zero for all the nodes in  $V$ . Explain how? Merely giving an example will not get any marks. Explanation is must! Similarly give an example of a connected graph  $G' = (V', E')$  that has maximum local clustering coefficient for all the nodes in  $V$ . (5)
7. Consider a full binary tree  $T$ . This is a tree in which every node other than the leaves have 2 children. There is a node in  $T$  which will be the central node with respect to closeness centrality. What will be the closeness generality value for that node? Can you generalize? (5)
8. Show an example where the eigen vector centrality of all nodes in the graph is the same while betweenness centrality for the nodes are not the same. Can you generalize the result! (6)