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VII SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING) MAKE UP EXAMINATIONS, DECEMBER 2023

SUBJECT: SOCIAL NETWORK ANALYSIS [CSE 4074]

REVISED CREDIT SYSTEM

(--/--/2023)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.

Q No.	Questions	Marks
1A.	Compute Betweenness centralities of nodes C, F, and G for the graph shown in Fig. 1. Also evaluate the Closeness centrality of the same three nodes. $\overbrace{\begin{subarray}{c} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	(5M)
1B.	Analyze the graph shown in Fig. 1, and draw the 1.5- and 2- degree egocentric networks of nodes C, F, and G with the ego node included.	(3M)



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1 C .	Construct the graph using circular layout for the adjacency matrix given in table 1. The size of each node should be										
	proportional to its degree centrality.										
	Table 1										
	Node	1	2		1	5	6	7			
	1	0	0	1	0	0	0	0			
	2 0 0 1 0 0 0 0										
	3 1 1 0 1 1 1 1										
	4	0	0	1	0	0	0	0			
	5	0	0	1	0	0	0	0			
	6	0	0	1	0	0	0	0			
	/	U	0	1	0	0	0	0			
	Apply Markov clustering algorithm to the graph given in Fig. 2. Compute the stochastic matrix followed by the resulting matrix and discover the clusters of the input graph. [Assume Power/Expansion parameter $e=2$ and Inflation parameter $r=2$]										
2B.	Explain force-directed layout with an example.								(3M)		
2C.	Explain the centrality measure where lower values indicate								(2M)		
3A.	Analyze how spectral clustering algorithm can be used to discover different communities present in the graph given in fig. 3. Explain with suitable formulas. Also construct Laplacian Matrix L, symmetric normalized version of L and tabulate the same for the graph.										

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	Fig. 3									
3B.	Explain how KL algorithm is used for community discovery with step-by-step process. Why regularization is needed for Markov Clustering algorithm (MCL) algorithm? Explain the different stage involved in Regularized MCL algorithm.									
3C.	Illustrate the important dimensions along with suitable examples for each. "Algorithms for community discovery vary on a number of important Dimensions"									
4A .	A startup has 8 employees with roles of CEO, intern, manager, and lead. Each of the new intern has a mentor associated and is mapped to an on-going project. Over a period of one year, they have been associated with 15 projects. The CEO wishes to organize this data in order to scale it to the next level, by efficiently merging any duplicate entries. For the sample data shown in table 2, analyze the data, identify the tuples which can be merged. Assume no partial match with a probability of 0.7 and m probabilities for each attribute listed in the table to be 0.97 throughout. Given u probability of first and last name is 0.8 and 0.7 respectively. Calculate u probability for rest of the attributes and identify the pairs which can be resolved into a single entity.									
	Table 2									
	First	Last		Designation	Draiaat	Marth				
	Name Name EID Designation Project Month									
	J Phillip 1 Intern Intelligence Jan									
	Jaden	P	2	Manager	Health Chatbot	Feb				
	Johan P 3 Lead NeuroLinguistics Jan									

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4B.	Outline the advantages of using Jaccard index over common neighbors and Adamic Adar over Jaccard Index with suitable scenarios.	(3M)						
4C.	Differentiate homophily and social influence.							
5A.	Differentiate edge betweenness and node betweenness. Calculate both for the graph in Fig. 4 with respect to node A and all of its links. $\overbrace{\begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(5M)						
5B.	Summarize influence maximization in viral marketing with suitable examples.	(3M)						
5C.	Explain triadic closure in social networks.	(2M)						