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VII SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2023

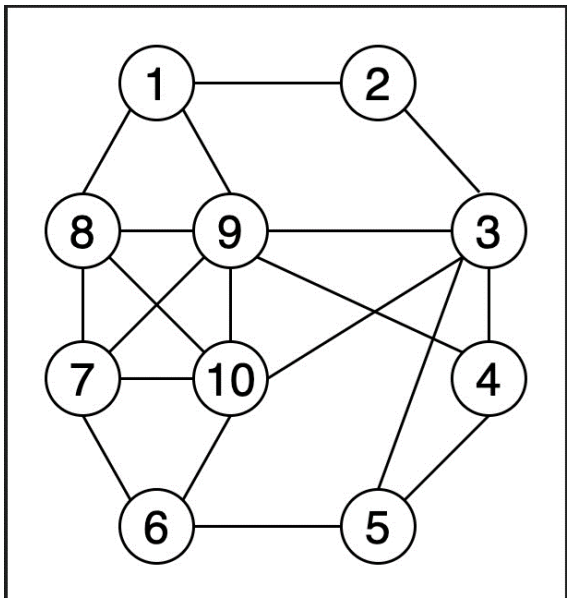
SUBJECT: SOCIAL NETWORK ANALYSIS [CSE 4074]

REVISED CREDIT SYSTEM
(05/12/2023)

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 8, 9, and 10 for the graph shown in Fig. 1. Also evaluate the Closeness centrality of the same three nodes.  Fig. 1	(5M)
1B	Analyze the graph shown in Fig. 1, and draw the 1.5- and 2-degree egocentric networks of nodes 8, 9, and 10 with the ego node included.	(3M)

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1C 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. (2M)

Table 1

Node	1	2	3	4	5	6	7	8
1	0	1	0	0	0	0	0	1
2	1	0	1	0	0	0	0	0
3	0	1	0	1	1	1	1	0
4	0	0	1	0	1	0	0	0
5	0	0	1	1	0	0	0	0
6	0	0	1	0	0	0	1	0
7	0	0	1	0	0	1	0	0
8	1	0	0	0	0	0	0	0

2A Apply Markov clustering algorithm to the graph given in Fig. 2. Discover the clusters of the input graph after computing the stochastic matrix followed by the resulting matrix. (Assume Power parameter e=2 and Inflation parameter r=2.) (5M)

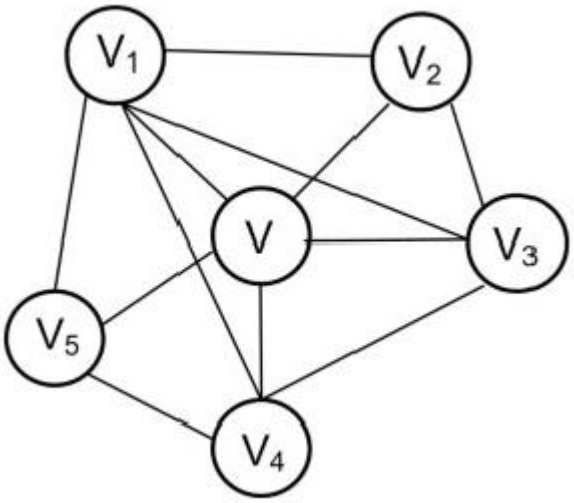

Fig. 2

2B Explain how to compensate for the following statement with a suitable example: “It is often difficult to see any patterns in very dense networks”. (3M)

2C Explain eigenvector centrality. How is it calculated? (2M)

3A Compute the partitions of the Fig. 3 graph after applying Kernighan-Lin (KL) algorithm to minimize the sum of (5M)

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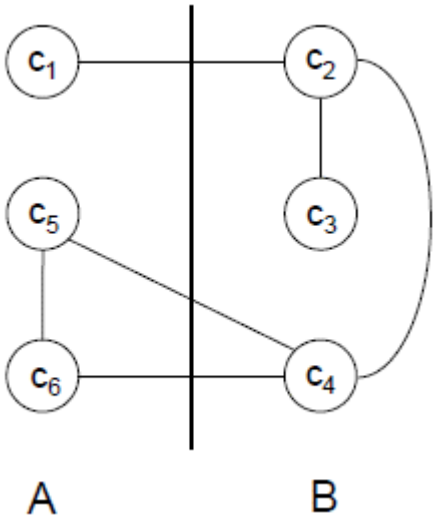
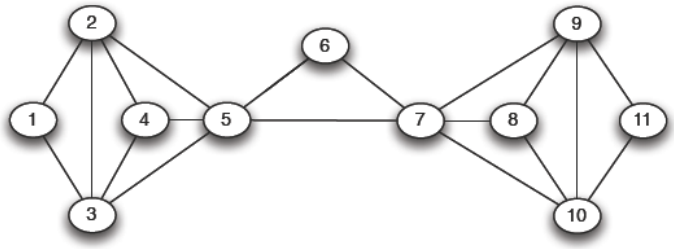
	the inter-cluster edge weights (assume initial cut size=3). Explain the step-wise procedure of the algorithm with suitable figures.  Fig. 3	
3B	Analyze Fig. 4 graph and detect different constituent communities with the help of Girvan- Newman algorithm after listing the complete procedure.  Fig. 4	(3M)
3C	Analyze Fig. 5 graph for community detection with the help of Spectral algorithm and compute Laplacian Matrix L of the graph and tabulate the same.	(2M)

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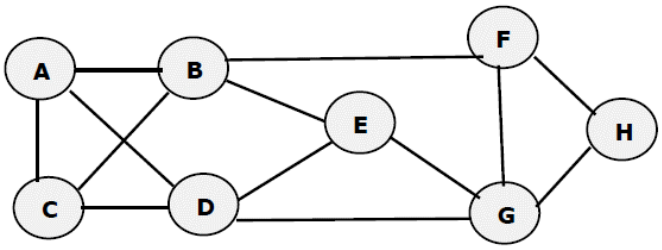

Fig. 5

4A The patient records table of a local clinic has 30 patients treated by 5 doctors over a period of three years. The authorities wish to organize data in a sophisticated manner and remove any duplicate records. For the sample shown in table 2, analyze the data, identify the tuples which can be merged into same entity. Assume no partial match with m probabilities for each attribute listed in the table to be 0.98 throughout. Given u probability of Department, First name and last name are 0.6, 0.78 and 0.82 respectively, calculate u probability for rest of the attributes and identify the pairs which can be resolved into a single entity. (5M)

Table 2

First Name	Last Name	Gender	Doctor details	Dept	PID	Year
Kiran	M	F	Hari	Medicine	001	1990
Kiran	Mendonca	M	Sameer	Ortho	003	1991
K	Mayor	O	Sameer	Surgery	008	1990

4B Identify which two nodes are most suitable to be merged into single entity for the graph given in Fig. 6 using Jaccard Index and Preferential Attachment. Consider the pairs, AJ, BP and WD only. (3M)

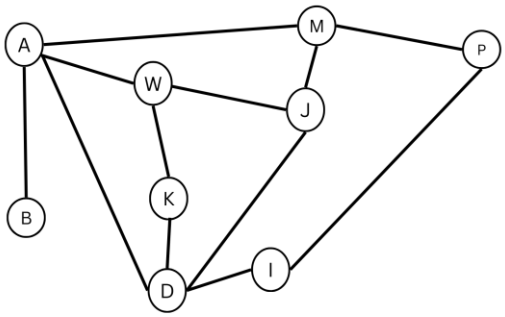

Fig. 6

4C Explain the concept of structural holes with a suitable example. (2M)

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5A	Explain influential blog discovery? What are the properties of the blogger?	(5M)
5B	Classify node measures into two broad categories & explain each of them with suitable examples.	(3M)
5C	Explain the Existential Tests for Social Influence.	(2M)