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MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING) END SEMESTER EXAMINATION, DECEMBER 2021

SUBJECT: SOCIAL NETWORK ANALYSIS [CSE 4074] REVISED CREDIT SYSTEM 17/12/2021 [Online]

Time: 75 Minutes

MAX. MARKS: 20M

Instructions to Candidates:

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

PART-B: Descriptive Questions

1A. Apply Markov clustering algorithm to the Biological network given in (5M) Fig.1A. Determine the clusters of the input graph after computing the stochastic matrix and resultant matrix. (Assume Power parameter e=2 and Inflation parameter r=2.)



Fig.1A.

1B. Analyze the social network given in Fig.1B and detect the different (3M) constituent communities after applying Girvan- Newman algorithm.



Fig.1B.

1C. Consider the Twitter social graph shown in Fig.1C, which indicates node to (2M) node interactions. Compute two nodes having high embeddedness score. Also, identify whether any structural hole exists in the graph and justify your answer.



2A. For the Vehicle dataset given in Table.2A compute the matching and non- (5M) matching scores after calculating the weights for each of the attributes, provided partial match is allowed with the value p=0.3. Assume that *m*-probabilities are 0.91, 0.95, 0.96, 0.98 and 0.95 for Name, Brand, Year of model, seating capacity and segment attributes respectively. Also, the *u*-probabilities for Name = 0.53, Brand= 0.65, Year =0.89, seating capacity = 0.72 and segment= 0.93 respectively.

Name	Brand	Year of	Seating	Segment			
		model	capacity				
Dezire	Maruti	2016	5-seater	Mid			

Santro	Hyundai	2007	5-seater	Mid
Alto 800	Maruti	2009	4-seater	Low
Fiesta	Ford	2014	5-seater	Mid
Innova	Toyota	2010	7-seater	High

- **2B.** For the Web-graph given in Fig.2B. answer the following questions:
 - a) Assume Eigen values lambda λ and Eigen vectors **x** of the Laplacian (3M) matrix L are provided to you, then which algorithm can be used to discover communities in the given web-graph.
 - b) Calculate the Laplacian Matrix L for the web-graph.



Fig.2B.

2C. Apply the concept of influence maximization to the Facebook-Friends (2M) network given in Fig.2C and compute the seed nodes based on high-degree heuristics as well as low-distance heuristics techniques and compare the results of the same.

