



MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

## VII SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2019

SUBJECT: SOCIAL NETWORK ANALYSIS [CSE 4012]

## REVISED CREDIT SYSTEM (28/11/2019)

Time: 3 Hours

MAX. MARKS: 50

## Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitably assumed.
- 1A. For the graph in Figure 1A, give the formula for Jaccard Index and Adamic Adar and compute the (5M) same for all possible edges. Mention the best pair with respect to every measure.



Figure 1A

- **1B.** Construct a graph G for six friends Alice, Bob, Charlie, Diana, Evan, Farooq, if there were six phone (3M) calls from Alice to Bob, eight phone calls from Alice to Diana, eleven phone calls from Alice to Evan, one phone call from Farooq to Alice, thirteen phone calls from Evan to Charlie, ten phone calls from Diana to Farooq, two phone calls from Evan to Bob, nine phone calls from Farooq to Bob and five phone calls from Farooq to Charlie. Answer the following questions from the constructed graph G.
  - i) State whether the graph is connected. Justify your answer.
  - ii) Define connected component(s) of a graph. Identify and draw the largest connected component in G if any exists.
  - iii) Draw the 2.5 degree egocentric network for Alice.

Table 1C

Number of nodes	Degree
1	5
1	3
4	2

- i) Draw the graph and compute its cohesion.
- ii) Compute the local clustering coefficient for the node with the highest degree. Show all the required steps.
- 2A. Identify the most central node in the given graph Figure 2A with the help of closeness centrality. (4M) Show all the required steps in your calculation.



Figure 2A

**2B.** Write a note on Spectral Algorithms.

(4M)

(3M)

- **2C.** Compute the centralisation for the graph given in Figure 2A with respect to degree centrality. Show (2M) all the required steps in your calculation.
- **3A.** Write any four differences between strong ties and weak ties. Explain the role of weak ties in job (3M) search. List two cases when strong ties will serve as better information services as compared to weak ties.
- **3B.** Draw a regular graph M consisting of 10 nodes. Create a new graph S from graph M by arbitrarily (4M) removing and introducing some new edges. Explain how the degree of arbitration of removing and introducing edges affects the two major characteristics of the resulting graph S.
- 3C. i) A data scientist is asked to analyse the data of a hospital which maintains the track record of its patients. The scientist wants to consolidate the data of individual patients so that no two entries are present for a single patient. The data spans over a period of ten years. Analyse the case study.
  ii) What is matching? Explain with an example.
- 4A. i) Explain how density is calculated in a Twitter network consisting of m nodes and k edges. Give an (4M) example of a graph with the highest density consisting of 6 nodes. Justify your answer.
  - ii) Analyse random layout according to the four principles of good graph layout.
- **4B.** Differentiate homophily and social influence with an appropriate example. (3M)
- **4C.** i) Define conductance. Explain the terms.
  - ii) Define modularity. Explain the terms.
  - iii) Calculate the embeddedness for the edges 32, 34, 36, 13 in the Figure 4C.



- 5A. What is triadic closure? How different is it from forbidden triad? Explain with appropriate examples. (3M)
- **5B.** i) In the Figure 5B is there any structural hole? Justify your answer.
  - ii) What does transition matrix signify? Give the transition matrix for the graph in Figure 5B.





- 5C. i) Write a note on social influence with respect to action.
  - ii) Write a note on Node Measures.

(3M)

(4M)