Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING) END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: PROGRAM ELECTIVE I – SOCIAL NETWORK ANALYTICS [ICT 4021]

REVISED CREDIT SYSTEM
(30/11/2018)

Time: 3 Hours. MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL questions.
- Write the detailed steps for all the problems/algorithms.
- Missing data, if any, may be suitably assumed.

1A. Find the normalized closeness centrality value for the graph given in Fig.Q.1A.

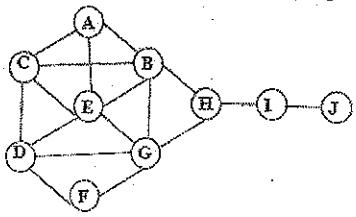

Fig.Q.1A

5

1B. What are networks? How are they different from graphs? Classify the following into directed and undirected network:
co-authorship network, URLs, phone calls, actor network, twitter following network, facebook friendship network. 3

1C. Define the terms walk, path, cycle and geodesic with respect to a graph. 2

2A. Use the Girvan-Newman method to detect two communities for the graph given in Fig.Q.2A. Show the detailed steps.

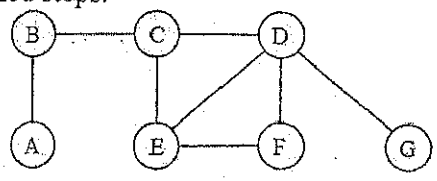

Fig.Q.2A

5

2B. Find the eigenvalue and the eigenvector for the matrix $M=\begin{bmatrix} 2 & 2 \\ 5 & -1 \end{bmatrix}$ 3

2C. What is average shortest distance? Find the average shortest distance for the network given in Fig.Q.2A 2

3A. Explain the decentralized search algorithm and analyze the algorithm with myopic search by giving an example and considering q=1. 5

Q1, Q2, Q3A – [signature]

Q3B, Q4 & Q5 – [signature]

3B. Determine the in-degree and out-degree distribution of the graph given in Fig.Q.3B.

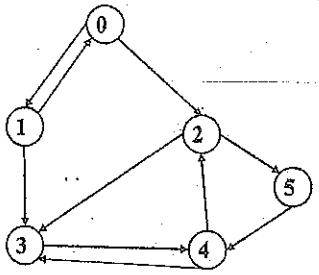

Fig.Q.3B

3C. Explain any two ways in which the Erdos-Renyi random graph differs from the real world networks. 3

4A. Consider the network depicted in Fig.Q.4A. Assume each node starts with the behavior 'B', and each node has a threshold of q=2/5 for switching to behavior 'A'. 2
(i) The nodes, 'c' and 'd' form a two-node set S of initial adopters of behavior A. If other nodes follow the threshold rule for choosing behaviors, which nodes will eventually switch to 'A'? Explain.
(ii) Find a cluster of density greater than (1-q) in the part of the graph outside S that blocks behavior A from spreading to all nodes, starting from S, at threshold q. Give explanation for the answer.

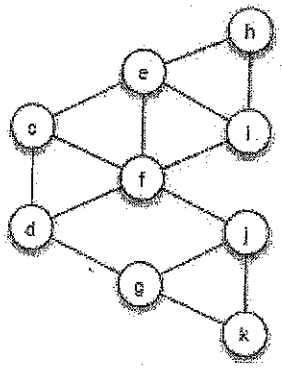

Fig. Q.4A

4B. Explain complete cascading and obstacles to cascades. 5

4C. Explain how cliques are used to detect communities in the social network. Give one example. 3

5A. Consider the marks scored by five students in four assignment as given in Table.Q.5A. Predict the marks scored by the student "S4" in 2nd assignment "A2" by using the user based collaborative filtering method. Assume neighborhood size=2 2

Table.Q.5A

Student name	A1	A2	A3	A4
S1	3	0	3	3
S2	5	4	0	2
S3	1	2	4	2
S4	3	?	1	0
S5	2	2	0	1

5B. Describe the preferential attachment model. 5

5C. Describe any four reasons for innovation that fails to spread through a population. 3 2