Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VI SEMESTER B.TECH. (INFORMATION TECHNOLOGY & COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: PROGRAM ELECTIVE III - SOCIAL NETWORK ANALYITICS [ICT 4021]

REVISED CREDIT SYSTEM

(29/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Agents of two different types (X and O) occupy cells on a grid as given in the *Table Q 1A*. Using this grid, **5**

i) Represent the *neighbor relationships* as a graph.

ii) Explain the dynamics of movement in the Schelling model of spatial segregation.

Table Q.1A

x	x				
x	o		o		
x	x	o	o	o	
x	o			x	x
	o	o	x	x	x
		o	o	o	

1B. How would you test the existence of homophily in a network? Draw an inverse gender homophilic network and analyze its homophilic properties. **3**

1C. What are augmented paths and constricted sets? State the relation between them if any. **2**

2A. Write the Girvan Newman algorithm. Apply one iteration of the Girvan Newman algorithm to the *Figure Q 2A* given below. **5**

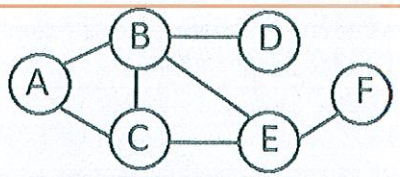

Figure Q.2A

2B. What is the clustering coefficient of a graph? State its relevance in analyzing a social network. 3

2C. Define pareto-optimality. Give an instance where a pareto-optimal solution is not socially optimal. 2

3A. Using the concept of cascades in a social network, explain how a video on YouTube goes viral. List the conditions under which a cascade occurs. 5

3B. Describe the Watts-Strogatz model. 3

3C. What is the *winner's curse* and under what scenario does it manifest? 2

4A. What is a social-affiliation network? Describe the various properties, types of edges and closures observed. 5

4B. Draw a directed graph which is a complete representation of the bow-tie structure of the world wide web. Indicate all components in your diagram and define them. 3

4C. What role do selection and social influence play in a social network? 2

5A. Define the following graph concepts using a *single* diagram for reference: 5

i) Structural hole
ii) Giant Component
iii) Betweenness of an edge
iv) Embeddedness of an edge
v) Strongly connected component

5B. For each of the nodes in the graph in *Figure Q.5B*, calculate the following: 3

i) Degree centrality
ii) Betweenness centrality
iii) Closeness centrality

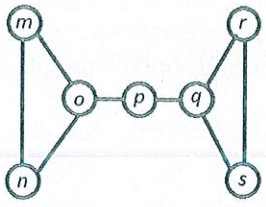

Figure Q.5B

5C. What graph metric is used to measure the *smallness* of a graph? Discuss any case study that confirmed the small world phenomenon. 2