



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

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: PROGRAM ELECTIVE III - SOCIAL NETWORK ANALYTICS [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,
- Represent the *neighbor relationships* as a graph.
 - Explain the dynamics of movement in the Schelling model of spatial segregation.

5

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.
- 1C.** What are augmented paths and constricted sets? State the relation between them if any.
- 2A.** Write the Girvan Newman algorithm. Apply one iteration of the Girvan Newman algorithm to the *Figure Q.2A* given below.

3

2

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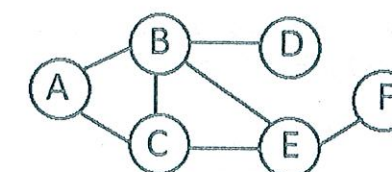


Figure Q.2A

- 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
- Structural hole
 - Giant Component
 - Betweenness of an edge
 - Embeddedness of an edge
 - Strongly connected component
- 5B. For each of the nodes in the graph in *Figure Q.5B*, calculate the following: 3
- Degree centrality
 - Betweenness centrality
 - Closeness centrality

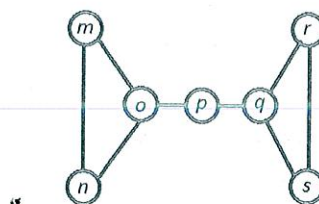


Figure Q.5B

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