

1058

B.E. (Computer Science and Engineering)  
Eighth Semester

CS-801: Network Science: Structural Analysis and Visualization

Time allowed: 3 Hours

Max. Marks: 50

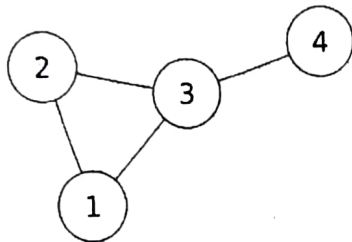
NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

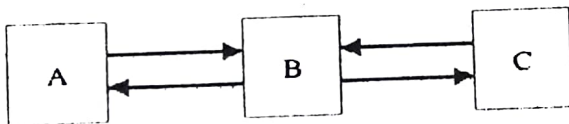
- |   |   |    |
|---|---|----|
| 1 | (i) What is degree matrix of a Graph?                             | 02 |
|   | (ii) What is Influence Maximization problem?                      | 02 |
|   | (iii) Why closeness centrality is better than degree centrality?  | 02 |
|   | (iv) Which model is used to model epidemic in immunityless hosts? | 02 |
|   | (v) What is Zipf Law?   | 02 |

**Section - A**

- |   |   |    |
|---|---|----|
| 2 | What is Erdos-Renyi random network? What are its properties and its uses?   | 10 |
| 3 | a) What is power law and its properties?  | 03 |
|   | b) What is a centrality measure? Compute Closeness, Betweenness, Katz and Eigenvector centrality for the following graph. Assume the required values. | 07 |



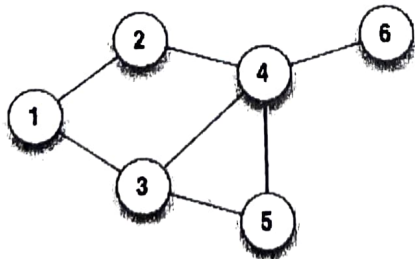
- |   |   |    |
|---|---|----|
| 4 | Consider three web pages A, B & C connected in the following way: | 10 |
|---|---|----|



Calculate HITS and PageRank score for all the pages. Consider damping parameters as 0.8.

**Section - B**

- |   |  |  |
|---|--|--|
| 5 | a) What is a random walk? Compute stationary distribution for following network: |  |
|---|--|--|



05

Assume that surfer can be present at any node in the beginning.

- |   |   |    |
|---|---|----|
|   | b) What is Fick's law? Discuss diffusion in context of networks.                  | 05 |
| 6 | What are SIS and SIR models? Discuss them for homogeneous population mixing case? | 10 |
| 7 | a) Discuss dynamics of rumour spreading.  | 05 |
|   | b) Discuss linear threshold and Independent cascade model.                        | 05 |