

2054

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

- Q1
- What are the different types of networks?
 - What do you mean by self-avoiding paths?
 - How is eigen vector centrality computed for nodes in a network?
 - How is Zipf's law applied in natural language processing and linguistics?
 - What do you mean by reciprocity?
- 10

SECTION - A

- Q2
- What is a complex network and how does it differ from simple networks? Explain with some real-world examples of complex networks. 5
 - Explain in detail the process to analyze and visualize complex networks? 5
- Q3.
- How does the Pareto distribution relate to the Pareto principle and also explain the Probability Density Function (PDF) and Cumulative Distribution Function (CDF) of the Pareto distribution. 5
 - What are some potential drawbacks or limitations of normalization? How is appropriate normalization method for a given dataset or analysis is chosen? 5
- Q4.
- What are the steps involved in constructing a random graph using the configuration model? How does the configuration model handle the presence of self-loops and multiple edges between nodes? 6
 - What is the HITS algorithm, and what problem does it aim to solve in web search? 4

SECTION-B

- Q5.
- How does the structure of a network influence the dynamics of diffusion processes? 5
 - How does the spectrum of the normalized Laplacian relate to the structure and properties of a graph? 5
- Q6. Explain and differentiate between SI, SIS, and SIR models in epidemiology? What are the main parameters of these models and how do they influence the spread and control of infectious diseases? 10
- Q7. Write short notes on the following:
- Influence maximization and its relevance in information diffusion
 - Different measures of node influence 10

x-x-x