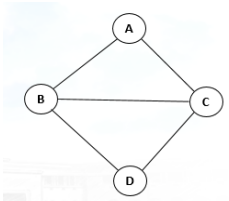
BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

I SEMESTER 2022-2023 CS G519 – Social Media Analytics, Mid Semester (closed book)

Time: 90 Minutes **Weightage: 25%** **Date: 1st Nov 2022**

1. (a) Define Konigsberg bridge problem. Represent Konigsberg bridge problem in two different ways.
   (b) Describe an application/network (not discussed in the class) that can be represented as a bipartite graph. [3]

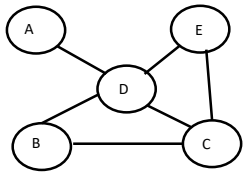
2. Find Eigenvector centrality of the graph given below: [4]



3. (a) Can we have a complete 4 node (A) and a 5 node (B) graphs each having exactly one unstable triangle?
   (b) Compare the degree distribution of a real network with that of random graph through a graph (no need to explain. Give only names). [4]

4. Similarity between two nodes of a network is given by Jaccard or cosine. What is the major drawback of these similarities? How can you rectify it? Deduce the modified similarity for it. [4]

5. To study about the structural holes, scientists study *redundancy* instead *local clustering coefficient*. The simplified definition of redundancy is as follows:
   The redundancy R_i of node i is the mean number of connections from a neighbor of i to other neighbors of i. (a) Find redundancy of D in the given graph. (b) What will be the minimum and the maximum possible redundancy values of a node in a graph? (c) Write local clustering coefficient in terms of redundancy R_i and degree k_i of a node i. [4]



6. Consider the following data of a graph and show that nodes have power distribution or not. [3]

Degree (d)	100	70	40	20	10	8	6	4
Degree Distribution (P_d)	1.6	3.3	10.8	46	198	317	580	1360

7. (a) How do you find k-core in a given network? Describe in clear steps.
   (b) Mark k-cores for k=1, 2, 3 in the given graph. [3]