JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2026

B.Tech-VIII Semester (CSE/IT)

COURSE CODE (CREDITS): 18B1WCI847(3) MAX MARKS: 25

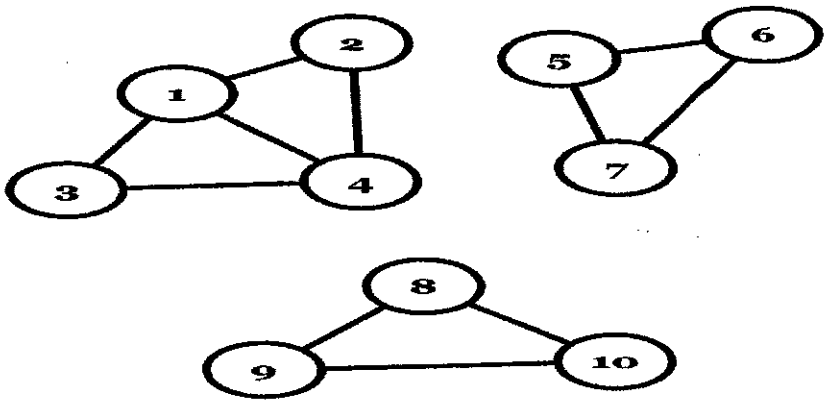
COURSE NAME: SOCIAL AND INFORMATION NETWORK ANALYSIS

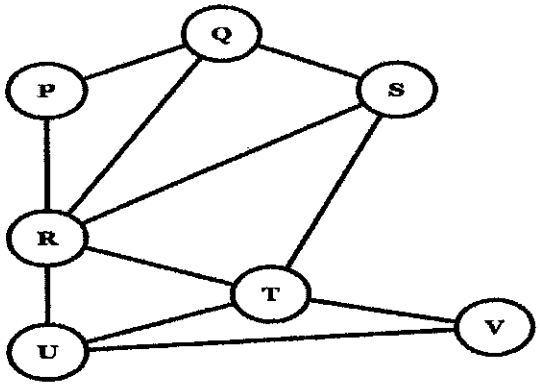
COURSE INSTRUCTOR: SEEMA RANI MAX. TIME: 1 Hour 30 Min

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of ***calculator is allowed***

Q.No	Question	CO	Marks
Q1	A network consists of **10 nodes** connected as shown below:  (a) Identify the number of components and their sizes. (b) Compute the Component Ratio. (c) Calculate the F-Measure of Fragmentation. (d) Interpret whether the network is highly cohesive or fragmented, with justification.	[CO4]	[5]
Q2	A pipe network (Maximum Flow problem) has the following structure: Source S connects to nodes A, B. Node A connects to nodes C and D. Node B connects to node D.Nodes C and D both connect to T (sink). Each pipe has a capacity of 1. (a) Identify all line-independent paths from S to T. (b) What is the Maximum Flow from S to T. (c) State Menger's Theorem and verify it using the paths found above. (d) What is the line connectivity $\lambda(S,T)$ in this network?	[CO3]	[4]
Q3	A researcher collects survey data from 50 students for network analysis and finds inconsistencies in the dataset. Explain why data cleaning is a critical step before analysis. Identify any four errors commonly found in network datasets and propose a solution for each.	[CO3]	[2]

Q4	 (a) Identify the node with the highest closeness centrality and justify (b) Compute the betweenness centrality of node T and R.	[CO4]	[2+4]
Q5	Differentiate between the following centrality measures: a) Degree centrality b) Closeness centrality c) Betweenness centrality d) Eigenvector centrality	[CO3]	[4]
Q6.	A company has two departments: Research (R) and Sales (S). Their interaction (including internal collaboration) is represented by: $\begin{bmatrix} 5 & 2 \\ 4 & 8 \end{bmatrix}$ Diagonal values → internal collaboration strength Off-diagonal values → influence between departments (a) Compute the eigenvalues of the matrix. (b) Find the principal eigenvalue and corresponding eigenvector. (c) Determine the eigenvector centrality of both departments. (d) Which department is more influential? Justify	[CO4]	[4]