JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

B.Tech-VI Semester (CSE/IT)

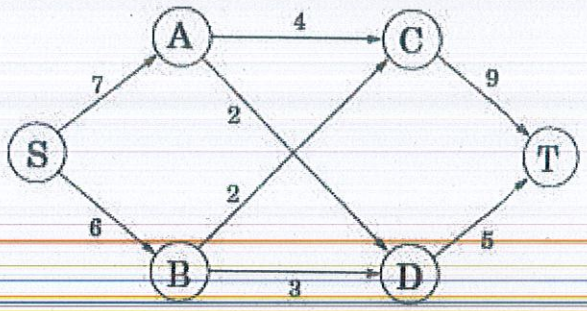
COURSE CODE (CREDITS): 20B1WCI732 (2) MAX. MARKS: 35

COURSE NAME: From Graph to knowledge Graph

COURSE INSTRUCTOR: Ravindara Bhatt MAX. TIME: 2 Hours

Note: *(a)The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

Q.No	Question	CO	Marks
Q1	a)With the help of a diagram explain the single Graph Neural Network (GNN) layer. b) Give the algorithm steps of TransE learning algorithm for knowledge graph. OR Can we do multi-hop reasoning i.e. answer complex queries on an incomplete, massive Knowledge Graph (KG)?	4	2.5+2.5
Q2	a) If G is a bipartite graph, then the maximum size of a matching in G equals the minimum size of a vertex cover of G. Prove or disprove. b) Illustrate the working of Greedy Bipartite matching with an example.	2	2.5+2.5
Q3	a) List one limitation of TransE method compared to TransR method. Give one example to demonstrate your point. b) List three applications of knowledge graphs in practice.	3	2.5+2.5
Q4	An edge of a flow network is called *critical* if decreasing the capacity of this edge results in a decrease in the maximum flow. Give an efficient algorithm that finds a critical edge in a network. **OR** Consider the following network in Figure A (the numbers are edge capacities).	2	5

	(i) Find the maximum flow f and a minimum cut. (ii) Draw the residual graph Gf (along with its edge capacities). In this residual network, mark the vertices reachable from S and the vertices from which T is reachable.  Figure A: Network with edge capacity		
Q5	Which of the following is/are true? Justify your answer? i)Ontologies are machine-readable and Interoperable ii)Ontologies can be built in a modular fashion iii)node2vec performs better on node classification. (True/ False)	3	2.5 + 2.5
Q6	a) You are given a set of activities to schedule among a large number of lecture halls, where any activity can take place in any lecture hall. You wish to schedule all the activities using as few lecture halls as possible. Give an efficient greedy algorithm to determine which activity should use which lecture hall. (This problem is also known as the interval-graph coloring problem. It is modeled by an interval graph whose vertices are the given activities and whose edges connect incompatible activities. The smallest number of colors required to color every vertex so that no two adjacent vertices have the same color corresponds to finding the fewest lecture halls needed to schedule all of the given activities.) b) Prove that the chromatic number of a graph equals the maximum of the chromatic numbers of its components.	2	2.5 + 2.5
Q7	a) State and Prove Mengers theorem. b) Every 3-connected graph has connectivity 3. (True/ False) c) Every graph with connectivity 4 is 2-connected. (True/ False)	2	3+ 1+ 1