

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION-2025

B.Tech-VI Semester (CS&IT)

COURSE CODE (CREDITS): 20B1WCI732 (2)

MAX. MARKS: 15

COURSE NAME: From Graph to Knowledge Graph

COURSE INSTRUCTORS: Ravindara Bhatt

MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.

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

Q.No	Question	CO	Marks
Q1	<p>a) The following statement may or may not be correct. In each case, either prove it (if it is correct) or give a counterexample (if it isn't correct). Always assume that the graph $G = (V, E)$ is undirected. Do not assume that edge weights are distinct unless this is specifically stated. Let e be any edge of minimum weight in G, then e must be part of some MST. [CO 1]</p> <p>b) Show how to find the maximum spanning tree of a graph, that is, the spanning tree of largest total weight. [CO1]</p> <p>c) Every Eulerian simple graph with an even number of vertices has an even number of edges. Prove or disprove. [CO 1]</p>	1	3
Q2	<p>a) Which of the following are graphic sequences? Provide a construction or a proof of impossibility for each. i. (4, 4, 3, 3, 2, 1, 1, 0) ii. (5, 5, 5, 4, 2, 1, 1, 1) [CO 1]</p> <p>b) An orientation of a graph G is a digraph D obtained from G by choosing an orientation ($x \rightarrow y$ or $y \rightarrow x$) for each edge $xy \in E(G)$. An oriented graph is an orientation of a simple graph. A tournament is an orientation of a complete graph. Consider the following algorithm whose input is a tournament T.</p> <p> Select a vertex x in T.</p> <p> i. If x has indegree 0, call x a king of T and stop.</p> <p> ii. Otherwise, delete $\{x\} \cup N^+(x)$ from T to form T'.</p> <p> iii. Run the algorithm on T'; call the output a king in T and stop.</p> <p>Prove that this algorithm terminates and produces a king in T. [CO 1]</p> <p style="text-align: center;">OR</p> <p>Design a linear-time algorithm for the following task.</p> <p><i>Input:</i> A connected, undirected graph G.</p> <p><i>Question:</i> Is there an edge you can remove from G while still leaving G connected?</p>	1	3

	Can you reduce the running time of your algorithm to $O(V)$?		
Q3	<p>a) Let T be a tree with average degree a. In terms of a, determine $n(T)$. [CO 1]</p> <p>b) Compute the diameter and radius of the biclique K_{mn}. [CO1]</p> <p style="text-align: center;">OR</p> <p>Prove that every graph with diameter d has an independent set at least $\lceil (1 + d) / 2 \rceil$ vertices. [CO1]</p> <p>c) Let T be a minimum-weight spanning tree in a weighted connected graph G. Prove that T omits some heaviest edge from every cycle in G. [CO1]</p> <p style="text-align: center;">OR</p> <p>Let G be a rooted tree where every vertex has 0 or k children. Given, k for what values of $n(G)$ is this possible? [CO1]</p>	1	3
Q4	<p>State True or False ? Justify your answer? [CO3]</p> <p>a) RDF does not uniquely identify instances of relationships of the same type.</p> <p>b) The process of associating a statement and a specific resource representing the statement is formally called <i>reification</i>.</p> <p>c) Simple ntriples notation has a set of triples terminated by a periods, where URI's are inside angle brackets</p> <p>d) Simple ntriples notation has a set of triples terminated by a bracket, where URI's are inside angle brackets.</p> <p>e) Wikipedia is a knowledge graph.</p> <p>f) The number of triplets in the RDF example given below is: __</p> <pre><rdf:Description rdf:about="http://www.ivan-herman.net"> <foaf:name>Ivan</foaf:name> <abc:myCalendar rdf:resource="http://.../myCalendar"/> <foaf:surname>Herman</foaf:surname> </rdf:Description></pre>	3	3
Q 5	<p>a) Find all pairs of people who are exactly 2 hops away from each other in the Movie graph (Cypher Query). [CO3]</p> <p>b) Create a new person node with the name "Student_1" and the born year 2004, and then add the label "Student" to the node (Cypher Query). [CO3]</p> <p>c) How can you create a new movie node with the label "Animation" and the title "Toy Story1", and also set the release year to 2025, but only if it doesn't already exist (Cypher Query)? [CO3]</p>	3	3