

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech- V Semester (CSE/IT)

COURSE CODE (CREDITS): 25B1WCI541 (3)

MAX. MARKS: 15

COURSE NAME: CONCEPT OF GRAPH THEORY

COURSE INSTRUCTOR: RBT

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

(c) Use of calculator is not allowed

Q.No	Question	CO	Marks
Q1	Determine whether the graphs below are isomorphic. G_1 G_2	1	3
Q2	a. Let G be a graph with at least two vertices. State True or False. The maximum degree is $\Delta(G)$, the minimum degree is $\delta(G)$. i. Deleting a vertex of degree $\Delta(G)$ cannot increase the average degree. ii. Deleting a vertex of degree $\delta(G)$ cannot reduce the average degree. b. Write down adjacency matrices and incidence matrices for a 3-vertex path.	1	1 + 2
Q3	a. State True or False. (5, 5, 5, 4, 2, 1, 1, 1) is a graphic sequence. Provide a construction or a proof of impossibility. b. Prove or disprove: Every u, v-walk contains a u, v-path.	1	1 + 2

Q4	a. Determine which trees have Prufer codes that (i) contain only one value (ii) have distinct values in all positions. b. There are five cities in a network. The cost of building a road directly between i and j is the entry at j in the matrix below. An infinite entry indicates that there is a mountain in the way and the road cannot be built. Determine the least cost of making all the cities reachable from each other. $\begin{pmatrix} 0 & 3 & 5 & 11 & 9 \\ 3 & 0 & 3 & 9 & 8 \\ 5 & 3 & 0 & \infty & 10 \\ 11 & 9 & \infty & 0 & 7 \\ 9 & 8 & 10 & 7 & 0 \end{pmatrix}$	2	1 + 2
Q5	A bipartite graph is a graph $G = (V, E)$ whose vertices can be partitioned into two sets ($V = V_1 \cup V_2$ and $V_1 \cap V_2 = \Phi$) such that there are no edges between vertices in the same set (for instance, if $u, v \in V_1$, there is no edge between u and v). Give a linear time algorithm to determine whether an undirected graph is bipartite. OR Let T be a minimum-weight spanning tree in G, and let T' be another spanning tree in G. Prove that T' can be transformed into T by a list of steps that exchange one edge of T' for one edge of T, such that the edge set is always a spanning tree and the total weight never increases.	2	3