MID-SEMESTER EXAMINATION, MAY-2023
INTRODUCTORY GRAPH THEORY (CSE 1004)

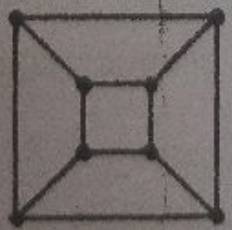
Programme:B.Tech(CSE & CSIT) **Semester: 2nd**
Full Marks: 30 **Time: 2 Hours**

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
CO-1: Define the fundamental concepts of graphs and apply them to study graph isomorphisms, Eulerian graphs, graphic sequences and digraphs.	L3, L3, L4, L3, L3, L3 L3, L3, L4	1(a),1(b), 1(c),2(a), 2(b),2(c) 3(a),3(b), 3(c)	2,2, 2,2, 2,2 2,2, 2
CO-2: Define trees, spanning trees and study its various concepts and apply the Kruskal's algorithm to find the minimum spanning tree and Dijkstra's algorithm to find the shortest path of a connected weighted graphs.	L3, L3, L3, L3, L3, L3	4(a),4(b), 4(c),5(a), 5(b),5(c)	2,2, 2,2, 2,2

*Bloom's taxonomy levels: Remembering (L1), Understanding (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

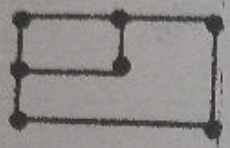
Answer all questions. Each question carries equal mark.

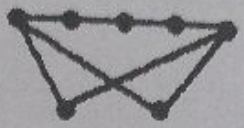
1. (a) Determine whether the graph given below decomposes into copies of P_4. 2



(b) Show that every graph has an even number of vertices of odd degree. 2

(c) Analyze the given pair of graphs and determine whether they are isomorphic or not. 2





2. (a) Determine the maximum number of edges in a bipartite graph with 12 vertices. 2

(b) If G is an undirected graph with n vertices and 25 edges such that each vertex of G has degree atleast 3, then determine the maximum possible value of n. 2

(c) Prove or disprove: Every Eulerian simple graph with an even number of vertices has an even number of edges. 2

3. (a) Show that every graph with n vertices and k edges has at least $n-k$ components. 2

(b) Show that if there is an n-vertex tournament with indegree equal to outdegree at every vertex then n is odd. 2

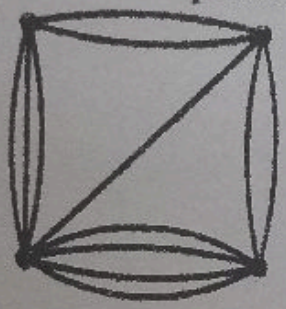
(c) Analyze and determine whether the sequence $5,5,4,3,2,2,2,1$ is a graphic sequence or not. If yes, draw the graph. 2

4. (a) Show that if G is an n-vertex connected graph with $n-1$ edges then G has no cycles. 2

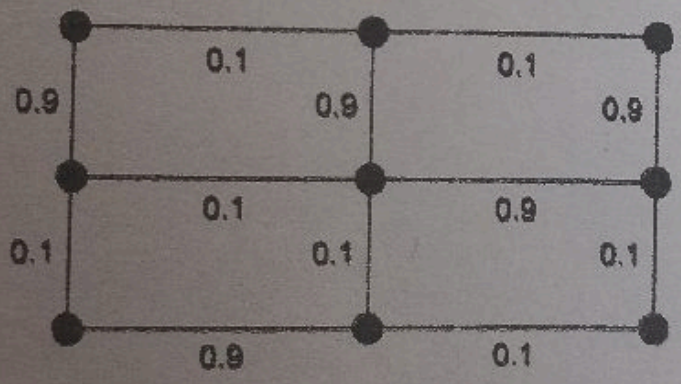
(b) If T is a tree with 10 vertices, then determine the sum of the degrees of all the vertices in T. 2

(c) Let T be a tree with average degree a. In terms of a, determine $n(T)$. 2

5. (a) Determine the number of spanning trees of the given graph by the matrix tree computation method. 2



(b) Consider the given undirected graph with edge weights as shown. 2



Determine the number of minimum weight spanning trees of the above graph and draw them.

(c) Show that the graph G is a tree if and only if G is connected and every edge is a cut-edge. 2

End of Questions