

TCS1027 GRAPH THEORY AND APPLICATIONS

Module 1

Introduction: What is graph, Application of graphs, Finite and infinite graphs, incidence and degree, isolated Vertex pendant Vertex, and Null graph, paths and circuits, isomorphism, sub graphs, a puzzle with multicolored cubes, walks, paths, and circuits, Connected graphs, disconnected graphs and components, Euler graphs, Operations on graphs, More on Euler graphs, Hamiltonian paths and circuits, The Traveling Salesman problem.

Module 2

Trees and Fundamental circuits: Trees, some properties of trees, pendant vertices in a tree, Distance and centers in a tree, Rooted and binary trees, On counting trees, Spanning trees, fundamental circuits, Finding all spanning trees of a Graph, Spanning trees in a Weighted graph.

Module 3

Cut set, and cut vertices: Properties of a cut set, all cut sets in a graph, Fundamental circuits and cut sets, connectivity and separability, Network flows, 1-Isomorphism, 2-Isomorphism.

Module 4

Planar and Dual Graphs: Combinatorial vs. Geometric Graphs, Planar graph, kuratowski's Two Graphs, Difference Representations of a planar graph, Detection of planarity, Geometric Dual, Combinatorial, Dual, More on criteria of planarity, Thickness and crossings.

Module 5

Matrix Representation of Graphs: Incidence Matrix Sub matrices of $A(G)$, Circuits Matrix, Fundamental Circuit Matrix and Rank of B , An application to a switching Network, Cut-set Matrix, Relationships among A_f , B_f and C_f . path Matrix, Adjacency Matrix.

Module 6

Coloring, Covering and partitioning: Chromatic number, Chromatic partitioning, Chromatics polynomial, Coverings, Four color problem.

Module 7

Directed Graphs: What's a directed Graphs, Some types of Digraphs, Digraphs and binary Relations, Directed paths and connectedness, Euler Digraphs, Trees with Directed Edges, Fundamental Circuits in Digraphs, Matrices A , B and C of Digraphs, Adjacency Matrix of a Digraph, Paired Comparisons and Tournaments, Acyclic Digraphs and Decyelization.

Text Book:

Narasingsh Deo, "Graph Theory with Applications to engineering and Computer Science", Prentice Hall of India, 2001.

Reference Book:

Douglas B. West, "Introduction to Graph theory", Pearson Education, 2002.