Unit 1 :

Graphs and operations on graphs
Definition and elementary results, Types of graphs, Isomorphism, Matrix representation of graphs: Adjacency matrix and incidence matrix, Subgraphs and induced graphs, Complement of a graph, Self complementary graphs, Union, intersection of graphs, Ring sum of two graphs.

Unit 2

 Connected Graphs
Definitions: walk, trail, tour, path and circuit, Definitions of connected, disconnected graphs, Dijkstra's shortest path algorithm, Connectivity: cut-vertex, vertex connectivity.

Unit 3 :

Tree Graphs
Tree : Definition, Theorem : A tree with n vertices has n -1 edges, Theorem : A connected graph G with n vertices and n – 1 edges is a tree, Theorem : A graph with n vertices is a tree if and only if it is circuit free and has n – 1 edges, Theorem : A graph G is a tree if and only if it is minimally connected, Center of a tree, Spanning tree: Definition and examples, Fundamental circuit and cut – set : Definition, Binary trees and elementary results, Kruskal's algorithm.

Unit 4 :

Directed Graphs
Definition, types of directed graphs, Directed (rooted) trees, arborescence and Polish notation, Isomorphism of digraphs, Connectedness in digraphs, Euler digraph, Network and flows: Definition, examples, Maximal flow algorithm.