

12.1 Introduction

A Graph in data structure is a type of non-linear data structure. Map is a well-established example of a graph. In a map, various cities are connected using links. These links can be considered as roads, railway lines or aerial network. Leonhard Euler was a scientist and he used graph theory to solve Seven Bridges of Konigsberg problem in 1736. He laid the foundations of Graph Theory idea of topology. The problem of Konigsberg bridge was to find whether there is a possible way to traverse every bridge exactly once. This is shown in below in figure (a) and is called as Euler's Tour.

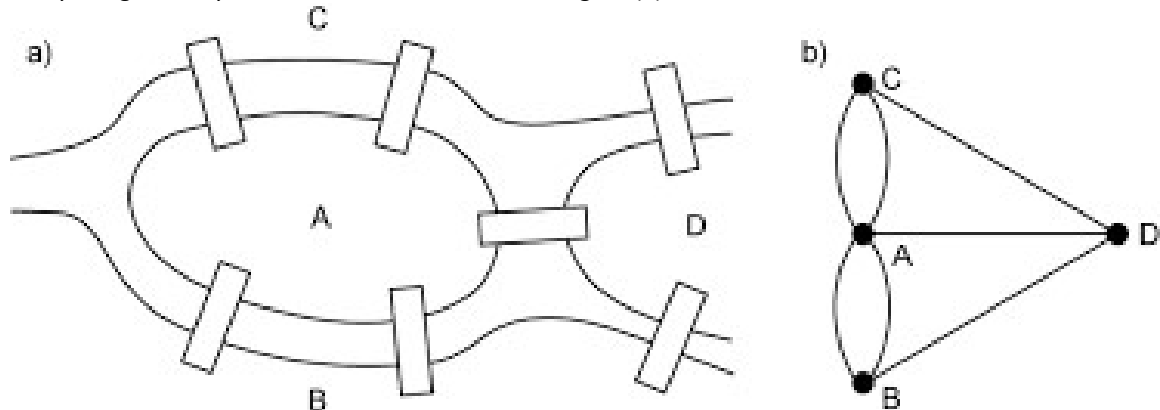


Figure: (a) Seven Bridges of Konigsberg and (b) Graphical Representation of figure (a)

As we can see the graphical representation of Konigsberg's seven bridges in figure b, here the points A, B, C and D are called as Vertex in graph terminologies and the paths joining to these vertices are called as edges.

We can represent any graphical scenario with the help of graphs and find a solution for the same.

Applications of Graphs in real life:

1. Solving Electricity Distribution problem
2. Maps like Cities, Rivers, Countries and so on
3. Water distribution in various areas
4. CAD/CAM applications
5. Finding Disaster Relief Solutions

12.2 Basic Concepts of Graphs

Nodes / Vertices: A graph contains a set of points known as nodes or vertices

Edge / Link / Arc: A link joining any two-vertex known as edge or Arc.

Graph: A graph is a collection of vertices and arcs which connects vertices in the graph.

A graph G is represented as $G = (V, E)$, where V is set of vertices and E is set of edges.

