Lab 07
Graph

Cảm ơn thầy Trần Duy Quang đã cung cấp template cho môn học

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Notes

Create a single solution/folder to store your source code in a week.

Then, create a project/sub-folder to store your source code of each assignment.

The source code in an assignment should have at least 3 files:

- A header file (.h): struct definition, function prototypes/definition.
- A source file (.cpp): function implementation.
- Another source file (.cpp): named YourID_Ex01.cpp, main function. Replace 01 by id of an assignment.

Make sure your source code was built correctly. Use many test cases to check your code before submitting to Moodle.

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Content

In this lab, we will review the following topics:

- Several terminologies in graph theory
- Connected components
- Depth first search
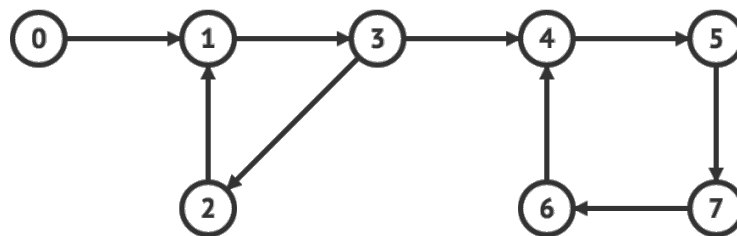- Breadth first search

3

Assignments

A: YY: 01

H: YY: 06

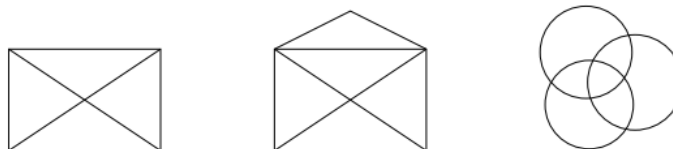## 3.1. Assignment 1 – Paper assignment

1. Given the following graph:

    a. Write down the adjacency-matrix representation.
    b. Write down the edge-list representation.
    c. Write down the adjacency-list representation.
2. Give an adjacency-list representation for a complete binary tree on 7 vertices. Give an equivalent adjacency-matrix representation. Assume that vertices are numbered from 1 to 7 as in a binary heap.
3. For each of the following graphs, either find an Eulerian circuit or prove that there is not one
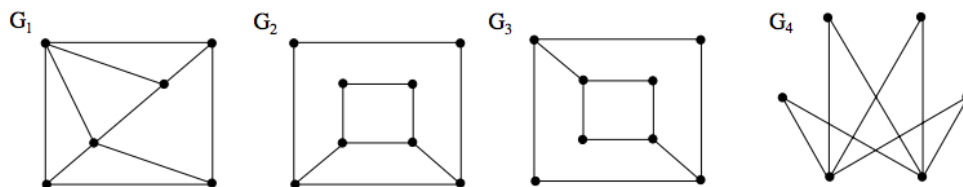
4. Find out if the following figures can be drawn without lifting the pencil from the paper and without repeating any line.

3.2. Assignment 2 – Paper Assignment - MST

Given the below weighted graph, you are asked to demonstrate step by step how to:

1. Find the minimum spanning tree using Prim's algorithm. Write down total weight, list of edges and draw the tree.
2. Find the minimum spanning tree using Kruskal's algorithm. Write down total weight, list of edges and draw the tree.
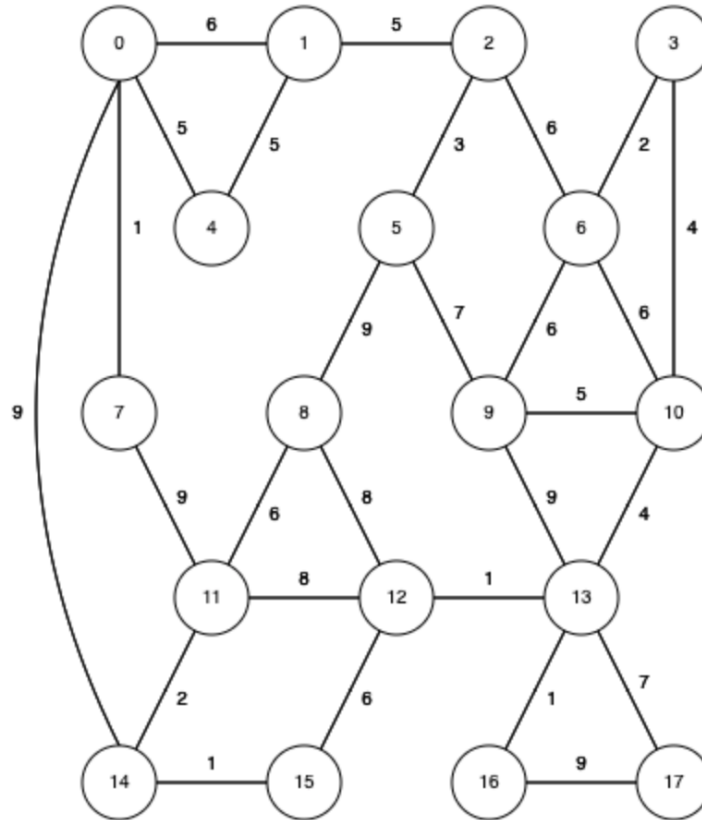
3.3. Assignment 3 – Depth First Search

Input:

An adjacency matrix of a graph in a text file

A start vertex (entered from the keyboard)

Output:

A text file containing a list of vertices are visited when performing depth first search

You can use this website to generate a graph. Link:
https://www.cs.usfca.edu/~galles/visualization/Dijkstra.html

3.4. Assignment 4 – Breadth First Search

Input:

An adjacency matrix of a graph in a text file

A start vertex (entered from the keyboard)

Output:

A text file containing a list of vertices are visited when performing breadth first search

You can use this website to generate a graph. Link:
https://www.cs.usfca.edu/~galles/visualization/Dijkstra.html

3.5. Assignment 5 – Connected Components

Input:

An adjacency matrix of a graph in a text file

Output:

A text file containing:

- First line: Number of connected components
- Next lines: each line containing a list of vertices in each component

3.6. Assignment 6 – Euler tour tree

Input:

An adjacency matrix of a tree (a directed graph) in a text file

A start vertex / the root of the tree (entered from the keyboard)

Output:

A text file containing a list of edges are visited on the Euler tour

https://en.wikipedia.org/wiki/Euler_tour_technique