Problem Set : Week 6

Due: 2pm on 15/9/25

Instructions

- Discussion is allowed and infact encouraged
- Answers must be written by yourself.
- All sources that are used to reach the solution must be mentioned.

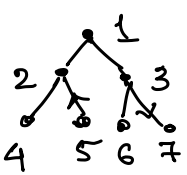
---

(1) Define the isomorphic relation on the set of all graphs as:

$$R_{iso} = \{\{G_1, G_2\} : G_1 \cong G_2\}$$

Show that R_{iso} is an equivalence relation. [4]

(2) Consider the complete binary tree on 7 vertices



Give adjacency list and adjacency matrix representations. [2+2]

(3) Given a graph on n vertices as an adjacency list and a vertex v,

i) give an algorithm to find the out-degree of v. What is its time complexity? [2]

ii) give an algorithm to find the in-degree of v. What is it's time complexity? [2]

Redo the questions for when the graph is given as an adjacency matrix. [3]

(4) Given a graph $G = (V, E)$ which is connected and undirected, given an $O(|V|+|E|)$-time algorithm to compute a path in G that traverses each edge in E exactly once in every direction. [5]