Assignment 4 – deadline: lab 5 (week 9-10)

Solve 1 of the problems from 1 to 7 (assigned to you in the Attendance Table) using the graph that you implemented in Assignments 1 and 2. You can additionaly solve problem 8 for extra 2 points (you must be able to explain how the 3 types of traversal work and why your solution is correct).

1) Write a program that, given a list of activities with duration and list of prerequisites for each activity, does the following:
   - verify if the corresponding graph is a DAG and perform a topological sorting of the activities using the algorithm based on predecessor counters.
   - prints the earliest and the latest starting time for each activity and the total time of the project.

2) Write a program that, given a graph with costs, does the following:
   - verify if the corresponding graph is a DAG and perform a topological sorting of the activities using the algorithm based on predecessor counters.
   - if it is a DAG, finds a highest cost path between two given vertices, in O(m+n).

3) Write a program that, given a graph, does the following:
   - verify if the corresponding graph is a DAG and performs a topological sorting of the activities.
   - if it is a DAG, finds the number of distinct paths between two given vertices, in O(m+n).

4) Write a program that, given an undirected connected graph, does the following:
   - constructs a minimal spanning tree of the graph using Kruskal's algorithm.
   - for the found tree gives the height of the tree, in O(m+n).

5) Write a program that, given an undirected connected graph, does the following:
   - constructs a minimal spanning tree of the graph using Prim's algorithm.
   - for the found tree gives the height of the tree, in O(m+n).

6) Write a program that, given an undirected connected graph, does the following:
   - constructs a minimal spanning tree of the graph using Kruskal's algorithm.
   - for the found tree and a given root node finds the number of leaf nodes, in O(m+n).

7) Write a program that, given an undirected connected graph, does the following:
   - constructs a minimal spanning tree of the graph using Prim’s algorithm.
   - for the found tree and a given root node finds the number of leaf nodes, in O(m+n).

8) Bonus 2p: Given the inorder, preorder and postorder traversals of an unknown binary tree, reconstruct the graph representing the tree.