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| **PLEASE ANSWER ALL QUESTIONS.** | **Total 30 Marks** |

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| **Name:** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **ID:** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| **QUESTION 1** | 10 marks |
| Consider an undirected graph where each of the nodes is labeled consecutively starting from 0.  You will be given a number of queries. For each query, you will be given a list of edges describing an undirected graph. After you create a representation of the graph, you must determine and report the shortest distance to each of the other nodes from a given starting position using the breadth-first search algorithm (BFS). Distances are to be reported in node number order, ascending. If a node is unreachable, print for that node.  For example, given a graph with nodes and edges, , , , a visual representation is:    The start node for the example is node . Outputs are calculated for distances to nodes through : .  **Input Description:**  The first line contains an integer , the number of queries. Each of the following sets of lines has the following format:   * The first line contains two space-separated integers and , the number of nodes and edges in the graph. * Each line of the subsequent lines contains two space-separated integers, and , describing an edge connecting node to node . * The last line contains a single integer, , denoting the index of the starting node.   **Output Description:**  For each of the queries, print a single line of space-separated integers denoting the shortest distances to each of the other nodes from starting position . These distances should be listed sequentially by node number (i.e., ), but should not include node . If some node is unreachable from , print as the distance to that node.  **P.T.O**   |  |  | | --- | --- | | **SAMPLE INPUT** | **SAMPLE OUTPUT** | | 2  4 2  0 1  0 2  0  3 1  1 2  1 | 1 1 -1  -1 1 | | |
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| **QUESTION 2**  Interview | 5 marks |
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| **QUESTION 3** | 10 marks |
| The height of a Binary Search Tree is the number of edges between the tree's root and its furthest leaf. Write a program that inserts integer values into a Binary Search tree and afterward displays the height of the tree.   |  |  | | --- | --- | |  |  |   In the above diagram, there are nodes in the longest root-to-leaf path that are connected by edges, meaning our BST's . Thus, we print as our answer.  **Input Description:**  The first line contains an integer, , denoting the number of nodes in the tree. Each of the subsequent lines contains an integer, , denoting the value of an element that must be added to the BST.   |  |  | | --- | --- | | **SAMPLE INPUT** | **SAMPLE OUTPUT** | | 7  3  5  2  1  4  6  7 | 3 | | |
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| **QUESTION 4**  Interview | 5 marks |
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| **\*\*END OF QUESTIONS\*\*** | |