IE 515 HW-1

Due date: November 2, 2023 23:59

1. Give a five-node network for which a breadth-first traversal examines the nodes in the same order as a depth-first traversal.

2. Suppose that you are given a shortest path problem in which all arc lengths are the same. How will you solve this problem in the least possible time?

3. The following table illustrates a number of possible duties for the drivers of a bus company. We wish to ensure, at the lowest possible cost, that at least one driver is on duty for each hour of the planning period (9 A.M. to 5 P.M.). Formulate and solve this scheduling problem as a shortest path problem.

Duty Hours	09-13	09-11	12-15	12-17	14-17	13-16	16-17
Cost	30	18	21	38	20	22	9

4. Code the Dijkstra's algorithm in order to solve the problem given in the previous question using your coding language of choice. Clearly identify the steps of the algorithm using comments and use a consistent and straightforward naming scheme for your variables *(and functions if you used any)*. The algorithm should be generic in a sense that it would run for any directed graph given. However, generalization of inputs *(i.e. reading the network form text)* is not mandatory.

5. Construct a heap using the numbers 6, 2, 4, 10, 9, 5 in the given sequence and perform the following operations:

   - Remove minimum
   - Update 10 to 3
   - Update 9 to 1
   - Remove minimum

   Illustrate every step of the operations clearly *(including the construction of the heap)*. At every step, use the last obtained heap.