Name: Reg. No.:

CS211 – Data Structures

Final Exam – January 17, 2020

1. *Note: No code is required for this question.* {20}
   (a) Show how an empty AVL tree will look like after inserting the following values in the given order:

   2, 9, 10, 1, 3, 8, 6, 4, 7, 5.

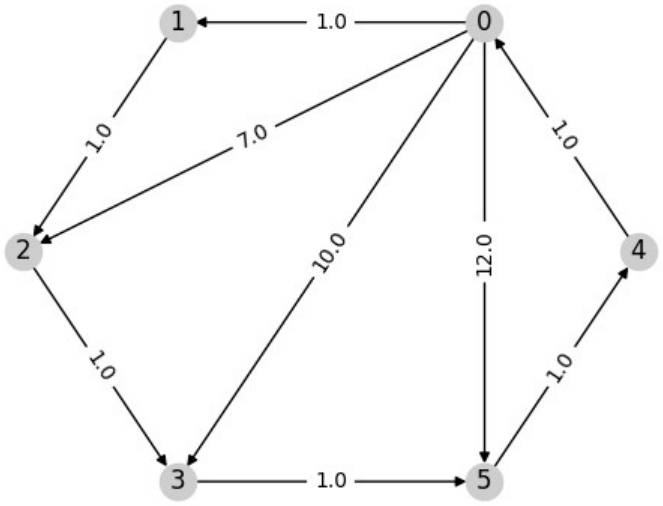
   (b) Sort the following values using heap sort and show all the intermediate steps:

   1, 3, 2, 4, 5.

   (c) How an empty hash table of size **7** using **open addressing** and **quadratic probing** would look like after inserting the following values in the given order:

   10, 24, 3, 17, 7, 9

   (d) Given the following graph, find the shortest path from the vertex 4 to all the other vertices using the Dijkstra algorithm. Show distances to every vertex for each iteration.



2. Do the following for an **undirected** Graph ADT implemented using **linked structures**. {10}
   (a) Write the node structure(s), data member(s) and their types required to implement the ADT.
   (b) Write code for an ADT function *VType* ***highest_degree()*** which should return the vertex with highest degree in the network. If you call any other function within this function, write code for that function as well.
   (c) Write code for an ADT function *queue<VType>* ***neighbors****(const VType v)* which should return the neighbors of the vertex *v*. If you call any other function within this function (other than functions related to the queue ADT), write code for that function as well.

3. Write code for a function *void* ***convert_to_heap****(int arr[], int n)*, which takes a random array *arr* of size *n* and converts it into a min heap. If you call any other function within this function, write code for that function as well. {10}

4. Write code for the following for the HashTable ADT which uses **chaining** with **multiplication** method. {10}
   (a) Data members and any structs that are used as data members
   (b) Constructor
   (c) Insert function
   (d) Delete function
   (e) Search function