CSCI 33500: Software Analysis and Design III

Summer 2025

Final Review

1 TRUE OR FALSE

1. Hash collision occur when two different keys generate the same hash value and map to the same index in the hash table

2. The push() operation for priority queues has a worst time complexity of O(log n).

3. The load factor of a hash map indicates the number of buckets in the hash table

4. All trees are graphs but not all graphs are trees

5. To print what an iterator is pointing to you have to dereference it using the * operator

6. A heap can be used to sort elements

7. A heap must always be a full binary tree

8. The insert method for hash tables has a best time complexity of O(1)

9. in hash maps, keys do not have to be unique

10. priority queues allow for random access like vectors

2 SHORT ANSWER

1. Write code that uses iterators in a vector of ints to print the elements

2. What is a collision in hash maps ?

3. What property must a binary heap satisfy to be considered a min-heap?

4. Write the formula to compute the load factor

5. What problem is cause by linear probing ?

6. Write the formula for quadratic probing

7. What is the worst time complexity for the heapify method ?

8. What is the best way to represent a graph in c++ for sparse graphs ?

9. Name a situation where you would use a priority queue over a hash map

10. When traversing std::unordered_map are iterators necessary? explain

3 CODING

1. Write a class for a graph data structure that uses a an adjacency list

    (a) Include a constructor that takes in one parameter for the number of nodes

    (b) write a method that adds edges

    (c) write a main function that creates a graph object with 7 nodes and adds 4 random edges

2. Write the method for inserting into a hash map