Time Complexity and Memory Efficiency – 11 points;
Suggested work & submission time less than 10min

Submission instructions:
Please submit a single file (use any file name) on TEACH under FinalExamProblem2 before 10:30am. You may write answers by hand and submit a scanned copy. There is no need to copy the questions; just **list the question numbers next to your answers.**

Answer the following 11 questions. Each correct answer brings 1 point, and incorrect answer will be penalized by -0.5 point to discourage random guessing. The minimum possible score is 0.

What is time complexity of the following operations for data structures with n elements:

1) AVL Sort algorithm of Bag implemented as a dynamic array?

   Solution: $O(n \log n)$

2) Add operation of Hash Table with linked lists, when the table size is m?

   Solution: $O(1)$

3) Add operation of Sorted Bag implemented as a dynamic array?

   Solution: $O(n)$

4) Remove operation of Heap implemented as a dynamic array?

   Solution: $O(1)$

5) Dijkstra's algorithm for a graph with m edges?

   Solution: $O(m \log n)$ where n is vertices

6) Remove operation of AVL tree?

   Solution: $O(\log n)$

7) Pop operation of Stack implemented as a static array?

   Solution: $O(1)$

Compare memory efficiency between the following pairs of data structures with the same number n of data elements. For example, comment: Is memory usage the same, or does one data structure take more memory than the other?

8) Deque implemented as a linked list; or
Stack implemented as a linked list?

Solution: Same memory usage

9) Hash Table with linked lists and the load factor greater than 1; or
Hash Table with linked lists and the load factor less than 1?

Solution: Hash table with load factor less than 1 Takes up more memory

10) BST; or AVL tree?

Solution: Same memory usage

11) Deque implemented as a dynamic array; or Heap implemented as a dynamic array?

Solution: Same memory usage