CSE220: Data Structures (Lab)

Fall 2024

Lab Quiz - 06

Duration: 30 Minutes

| Name: | ID: | Section: |
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### **Question 1 [15 Points]**

You are given several buckets with water levels represented by a min-heap. In each operation, you choose the smallest non-zero water level, denoted by x, and remove x units of water from all non-empty buckets. Your task is to determine the minimum number of operations required to empty all the buckets. **You need to write the extract\_min(), sink(), and the minimum\_operation\_find() methods /functions.**

| **Sample Input:** | **Sample Output:** |
| --- | --- |
| heap = [1, 5, 9, 10, 12] | 5 |

| **Explanation** | | | |
| --- | --- | --- | --- |
| Heap Array | Heap Visual | Heap Array | Heap Visual |
| **Initial Stage:**  [1, 5, 9, 10, 12] | **1**  **/ \**  **5 9**  **/ \**  **10 12** | **Step 3:**  **Extracted the minimum value 4**  [5, 7, 0, 0, 0]  **Subtracted the minimum value (4) from each non-zero value**  [ 1, 3, 0, 0, 0] | **1**  **/ \**  **3 0**  **/ \**  **0 0** |
| **Step 1:**  **Extracted the minimum value 1**  [ 5, 9, 10, 12, 0]  **Subtracted the minimum value (1) from each non-zero value**  [4, 8, 9, 11, 0] | **4**  **/ \**  **8 9**  **/ \**  **11 0** | **Step 4:**  **Extracted the minimum value 1**  [ 3, 0, 0, 0, 0]    **Subtracted the minimum value (1) from each non-zero value**  [ 2, 0, 0, 0, 0] | **2**  **/ \**  **0 0**  **/ \**  **0 0** |
| **Step 2:**  **Extracted the minimum value 4**  [8, 9, 11, 0, 0]  **Subtracted the minimum value (4) from each non-zero value**  [ 4, 5, 7, 0, 0] | **4**  **/ \**  **5 7**  **/ \ /**  **0 0 0** | **Step 5:**  **Extracted the minimum value 2**  [ 0, 0, 0, 0, 0] | **0**  **/ \**  **0 0**  **/ \**  **0 0** |