National Institute of Technology Calicut
Department of Computer Science and Engineering
Third Semester B. Tech.(CSE)
CS2092D Programming Laboratory
Modification Question for Assignment-4 (07.10.2021)

Instructions: For the question given below, write the design in the shared doc. Upload your design as a .pdf file in the eduserver on or before 3:00 pm in the link provided for *submitting the design of the Modification question.* After submitting the design, implement your design using *C Language* and show the output of your program to the evaluator for the test cases given for the Modification question in eduserver. In any case, you should submit your C Program on or before 3:45 pm in the link provided for *submitting the C Program for the Modification question.* In case of clarifications, your evaluator will help you.

Marks (Design + Implementation): 5 + 3

Time: Design: Till 3:00 pm and Implementation: Till 3:45 pm. The marks for implementation will be based on the results for the test cases. The evaluator will be conducting a viva for a maximum of 5 minutes.

QUESTION

1. You are in a Magic Show with Abhishek. The Magician has N number of bags containing a certain number of chocolates in it. The Magician called Abhishek and told him to pick a bag and eat all the chocolates in it. When Abhishek takes a bag X and eats all the chocolates, the Magician fills it with half the number of chocolates present in X earlier and puts X back with the other bags. Abhishek repeats this process at most M times, and he wants to get the maximum number of chocolates possible. Assume that Abhishek knows the count of the chocolates in each bag. Find the maximum number of chocolates that Abhishek can get using the priority queue. Print the contents of the priority queue before each bag is selected.

   Note: If there are B number of chocolates in the chosen bag, the Magician puts

   - $B/2$ chocolates in it if B is an even number.
   - $(B-1)/2$ chocolates in it if B is an odd number.

   Input format:

   - First-line contains an integer $N \in [1 : 10^4]$, the total number of bags.
   - Second-line contains an integer $M \in [1 : 10^5]$, the number of times Abhishek can pick the bags.
   - Third-line lists the N space-separated integers in the range $[1 : 10^4]$, the number of chocolates in each bag.

   Output Format:

   - The first m lines: i^{th} line represents the contents of the heap before Abhishek picks the i^{th} bag as space separated integers in the increasing order of their position in the Array.
   - $m + 1^{th}$ line: An integer representing the maximum number of chocolates that Abhishek can get.

   Please note that you have to use the pseudo-code in the CLRS book for implementing the operations on priority queue. Your program should read the number of chocolates in each bag one by one and insert it into the priority queue directly by calling the MAX-HEAP-INSERT function without storing it into another array.

Sample Input1:
3
4
3 5 6

Sample Output1:
6 3 5
5 3 3
3 3 2
3 2 1
17

Sample Input2:
5
5
2 4 6 8 10

Sample Output2:
10 8 4 2 6
8 6 4 2 5
6 5 4 2 4
5 4 4 2 3
4 3 4 2 2
33