Ben-Gurion University of the Negev

Data Structures

202.1.1031

Assignment No. 4 - Solution

Authors:
Name 1 (I.D 1)
Name 2 (I.D 2)

Publish date: 20.5.2023
Submission date: 10.06.2023

אוניברסיטת בן-גוריון בנגב
Ben-Gurion University of the Negev

Contents

Tasks and Questions

1 An example of Pseudo-Code

Remove this example:

Function: FindMax(L)

Input: A List L of n ***comparable*** values.
Output: The maximal value within L

1: $max \leftarrow L[0]$
2: **for** $1 \leq i < n$ **do**
3: **if** $L[i] > max$ **then**
4: Update max value to $L[i]$ *// Remember that you can describe an action in words, as long as it is clear how to implement it.*
5: **end if**
6: **end for** *// This is a comment in the pseudo-code. Comments should not be included in it.*
7: **return** max

2 Skip-List

2.1 Warm-Up and Familiarization

2.1.1 Implementation of Abstract Functions

Answer 2.1: Implementation in code

2.1.2 Analysis of the Probabilistic Process

Answer 2.2: The tables are:

p = <Insert the value of p here>							
x	$\hat{\ell}_1$	$\hat{\ell}_2$	$\hat{\ell}_3$	$\hat{\ell}_4$	$\hat{\ell}_5$	**Expected Level** ($E[\ell]$)	**Average delta** ($\frac{1}{5} \cdot \sum_{i=1}^{5}(\hat{\ell}_i - E[\ell])$)
10	?	?	?	?	?	?	?
100	?	?	?	?	?	?	?
1000	?	?	?	?	?	?	?
10000	?	?	?	?	?	?	?

Answer 2.3:

Answer 2.4:

2.1.3 Analysis of the operations

Answer 2.5: Implementation in code

Answer 2.6: The tables are:

p = <Insert the value of p here>			
x	Average Insertion	Average Search	Average Deletion
1000	?	?	?
2500	?	?	?
5000	?	?	?
10000	?	?	?
15000	?	?	?
20000	?	?	?
50000	?	?	?

Answer 2.7: The graph is:

Answer 2.8:

Answer 2.9:

Answer 2.10:

Answer 2.11:

2.2 Order Statistics

Answer 2.12:

3 Hashing

3.1 Introduction

3.1.1 Hash Functions

Answer 3.1:

Answer 3.2:

3.2 Hash Implementations

Answer 3.3: Implementation in code

Answer 3.4: Implementation in code

Answer 3.5: Implementation in code

3.3 Hash Tables

3.3.1 Introduction

Answer 3.6: Implementation in code

Answer 3.7: Implementation in code

Answer 3.8: The results are:

Linear Probing		
max α	Average Insertion	Average Search
1/2	?	?
3/4	?	?
7/8	?	?
15/16	?	?

Answer 3.9:

Answer 3.10: The results are:

Chaining		
max α	Average Insertion	Average Search
1/2	?	?
3/4	?	?
1	?	?
3/2	?	?
2	?	?

Answer 3.11:

Answer 3.12:

3.4 Theoretical Questions

Answer 3.13:

Answer 3.14:

Answer 3.15:

Answer 3.16:

4 Designing a data structure according to given specifications

Answer 4.1:

Good Luck!