

Unit 12 - Week 10 : Randomization and Data Structures

Course outline

How does an NPTEL online course work?

Week 0:Prerequisite

Week 1: Introduction to Randomized Algorithms

Week 2: Probability Review

Week3: Moments and Deviations

Week4: Probabilistic Method

Week 5: Markov Chains

Week 6 : Markov Chains-II

Week 7: Number Theoretic Algorithms

Week 8: Graph Theoretic Algorithms

Week 9 : Approximate Counting

Week 10 : Randomization and Data Structures

- ☐ Treaps, Randomization, Data Structures
- ☐ Hashing, Randomization, Data Structures
- ☒ Quiz : Assignment 10
- ☐ Weekly feedback form for week 10

Week 11 : Computational Complexity

Week 12 : Summary

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Assignment 10

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-04-08, 23:59 IST.

1) Consider a treap T with 100 elements. Assume that the keys are numbers from 1 to 100. Assume that the priorities are also numbers from 1 to 100. **1 point**

The maximum possible height of T is

- ☐ 99
- ☐ 50
- ☐ 7
- ☐ 100

No, the answer is incorrect.
Score: 0
Accepted Answers:
100

2) Consider a treap T with n elements. Assume that the keys are numbers from 1 to n . Assume that the priorities randomly chosen, uniformly and independently for each key from $[0, 1]$. The expected height of T is **1 point**

- ☐
 $O(n)$
- ☐
 $O(n^2)$
- ☐
 $O(1)$
- ☐
 $O(\log n)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
 $O(\log n)$

3) Consider a treap T where the keys are numbers 1 to 15. Assume that the height of T is 4. The key value of the root node is **1 point**

- ☐ 1
- ☐ 8
- ☐ 15
- ☐ 7

No, the answer is incorrect.
Score: 0
Accepted Answers:
8

4) Let H be a 2-universal family of hash functions from set $M = \{0, 1, \dots, m\}$ to $N = \{0, 1, \dots, n\}$, with $m \geq n$. **1 point**

Let x be any element of M . Let X denote the number of elements y in M such that $h(x) = h(y)$ where h is chosen uniformly at random from H . Which of the following statements are true?

- ☐
 $\mathbb{E}[X] = m$ for some x
- ☐
 $\mathbb{E}[X] \leq \frac{m}{n}$ for every x .
- ☐
 $\mathbb{E}[X] > \frac{m}{n}$ for every x .
- ☐
 $\mathbb{E}[X] \geq \frac{m}{n}$ some x .

No, the answer is incorrect.
Score: 0
Accepted Answers:
 $\mathbb{E}[X] \leq \frac{m}{n}$ for every x .

5) Assume that the size of the dynamic set is $O(n)$. The expected time taken for searching an element in a hash table of size $O(n)$ is **1 point**

- ☐
 $(n \log n)$
- ☐
 (n)
- ☐
 $(\log n)$
- ☐
 $O(1)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
 $O(1)$