Round 1

Which scheme uses a randomization approach?

1. hashing by division
2. hashing by multiplication
3. universal hashing
4. open addressing

universal hashing

Which hash function satisfies the condition of simple uniform hashing?

1. h(k) = lowerbound(km)
2. h(k)= upperbound(mk)
3. h(k)= lowerbound(k)
4. h(k)= upperbound(k)

h(k) = lowerbound(km)

A good hash approach is to derive the hash value that is expected to be dependent of any patterns that might exist in the data.

1. TRUE
2. FALSE

FALSE

What is the hash function used in the division method?

1. h(k) = k/m
2. h(k) = k mod m
3. h(k) = m/k
4. h(k) = m mod k

h(k) = k mod m

What can be the value of m in the division method?

1. Any prime number
2. Any even number
3. 2p – 1
4. 2p

Any prime number

Which scheme provides good performance?

1. open addressing
2. universal hashing
3. hashing by division
4. hashing by multiplication

universal hashing

Using division method, in a given hash table of size 157, the key of value 172 be placed at position _____

1. 19
2. 72
3. 15
4. 17

15

How many steps are involved in creating a hash function using a multiplication method?

1. 1
2. 2
3. 3
4. 4

2

What is the hash function used in multiplication method?

1. h(k) = floor(m(kA mod 1))
2. h(k) = ceil(m(kA mod 1))
3. h(k) = floor(kA mod m)
4. h(k) = ceil(kA mod m)

h(k) = floor(m(kA mod 1))

What is the advantage of the multiplication method?

1. only 2 steps are involved
2. using constant
3. value of m not critical
4. simple multiplication

value of m not critical

What is the table size when the value of p is 7 in multiplication method of creating hash functions?

1. 14
2. 128
3. 49
4. 127

128

What is the value of h(k) for the key 123456?
Given: p=14, s=2654435769, w=32

1. 123
2. 456
3. 70
4. 67

67

What is the average retrieval time when n keys hash to the same slot?

1. Theta(n)
2. Theta(n^2)
3. Theta(nlog n)
4. Big-Oh(n^2)

Theta(n)

Collisions can be reduced by choosing a hash function randomly in a way that is independent of the keys that are actually to be stored.

1. TRUE
2. FALSE

TRUE

Double hashing is one of the best methods available for open addressing.

1. TRUE
2. FALSE

TRUE

What is the hash function used in Double Hashing?

1. (h1(k) – i*h2(k))mod m
2. h1(k) + h2(k)
3. (h1(k) + i*h2(k))mod m
4. (h1(k) + h2(k))mod m

(h1(k) + i*h2(k))mod m

The value of h2(k) can be composite relatively to the hash table size m.

1. TRUE
2. FALSE

FALSE

What is the running time of double hashing?

1. Theta(m)
2. Theta(m^2)
3. Theta(m log k)
4. Theta(m^3)

Theta(m)

Which technique has the greatest number of probe sequences?

1. Linear probing
2. Quadratic probing
3. Double hashing
4. Closed hashing

Double hashing

What is a hash table?

1. A structure that maps values to keys
2. A structure that maps keys to values
3. A structure used for storage
4. A structure used to implement stack and queue

A structure that maps keys to values

If several elements are competing for the same bucket in the hash table, what is it called?

1. Diffusion
2. Replication
3. Collision
4. Duplication

Collision

What is direct addressing?

1. Distinct array position for every possible key
2. Fewer array positions than keys
3. Fewer keys than array positions
4. Same array position for all keys

Distinct array position for every possible key

What is the search complexity in direct addressing?

1. O(n)
2. O(logn)
3. O(nlogn)
4. O(1)

O(1)

What is a hash function?

1. A function has allocated memory to keys
2. A function that computes the location of the key in the array
3. A function that creates an array
4. A function that computes the location of the values in the array

A function that computes the location of the key in the array

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Which of the following is not a technique to avoid a collision?

1. Make the hash function appear random
2. Use the chaining method
3. Use uniform hashing
4. Increasing hash table size

Increasing hash table size

What is simple uniform hashing?

1. Every element has equal probability of hashing into any of the slots
2. A weighted probabilistic method is used to hash elements into the slots
3. Elements has Random probability of hashing into array slots
4. Elements are hashed based on priority

Every element has equal probability of hashing into any of the slots

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In simple uniform hashing, what is the search complexity?

1. O(n)
2. O(logn)
3. O(nlogn)
4. O(1)

O(1)

In simple chaining, what data structure is appropriate?

1. Singly linked list
2. Doubly linked list
3. Circular linked list
4. Binary trees

Doubly linked list

What data organization method is used in hash tables?

1. Stack
2. Array
3. Linked list
4. Queue

Linked list

The case in which a key other than the desired one is kept at the identified location is called?

1. Hashing
2. Collision
3. Chaining
4. Open addressing

Collision

What is the time complexity of Build Heap operation. Build Heap is used to build a max(or min) binary heap from a given array. Build Heap is used in Heap Sort as a first step for sorting.

1. O(nLogn)
2. O(n^2)
3. O(Logn)
4. O(n)

O(n)

Suppose we are sorting an array of eight integers using heapsort, and we have just finished some heapify (either maxheapify or minheapify) operations. The array now looks like this: 16 14 15 10 12 27 28 How many heapify operations have been performed on r

1. 1
2. 2
3. 3
4. 4

2

A max-heap is a heap where the value of each parent is greater than or equal to the values of its children. Which of the following is a max-heap?

1. A
2. B
3. C
4. D

B

A 3-ary max heap is like a binary max heap, but instead of 2 children, nodes have 3 children. A 3-ary heap can be represented by an array as follows: The root is stored in the first location, a[0], nodes in the next level, from left to right, is stored fr

1. 1, 3, 5, 6, 8, 9
2. 9, 6, 3, 1, 8, 5
3. 9, 3, 6, 8, 5, 1
4. 9, 5, 6, 8, 3, 1

9, 5, 6, 8, 3, 1

Suppose the elements 7, 2, 10 and 4 are inserted, in that order, into the valid 3- ary max heap found in the above question, Which one of the following is the sequence of items in the array representing the resultant heap?

1. 10, 7, 9, 8, 3, 1, 5, 2, 6, 4
2. 10, 9, 8, 7, 6, 5, 4, 3, 2, 1
3. 10, 9, 4, 5, 7, 6, 8, 2, 1, 3
4. 10, 8, 6, 9, 7, 2, 3, 4, 1, 5

10, 7, 9, 8, 3, 1, 5, 2, 6, 4

Consider a binary max-heap implemented using an array. Which one of the following array represents a binary max-heap?

1. 25,12,16,13,10,8,14
2. 25,12,16,13,10,8,1
3. 25,14,16,13,10,8,12
4. 25,14,12,13,10,8,16

25,14,16,13,10,8,12

What is the content of the array after two delete operations on the correct answer to the previous question?

1. 14,13,12,10,8
2. 14,12,13,8,10
3. 14,13,8,12,10
4. 14,13,12,8,10

14,13,12,8,10

In a binary max heap containing n numbers, the smallest element can be found in time

1. O(nLogn)
2. O(n^2)
3. O(Logn)
4. O(n)

O(n)

Given two max heaps of size n each, what is the minimum possible time complexity to make a one max-heap of size from elements of two max heaps?

1. O(nLogn)
2. O(n^2)
3. O(Logn)
4. O(n)

O(n)

Consider any array representation of an n element binary heap where the elements are stored from index 1 to index n of the array. For the element stored at index i of the array (i <= n), the index of the parent is

1. i - 1
2. floor(i/2)
3. ceiling(i/2)
4. (i+1)/2

floor(i/2)