Started on	Saturday, 16 March 2024, 2:13 PM
State	Finished
Completed on	Saturday, 16 March 2024, 2:27 PM
Time taken	13 mins 16 secs
Grade	**10.00** out of 10.00 (**100**%)

Question 1

Correct

Mark 1.00 out of 1.00

Which one of the following hash functions on integers will distribute keys most uniformly over 10 buckets numbered 0 to 9 for i ranging from 0 to 20?

- $h(i) = i^3 \bmod 10$ ✔
- $h(i) = (12 * i) \bmod 10$
- $h(i) = i^2 \bmod 10$
- $h(i) = (11 * i^2) \bmod 10$

The correct answer is: $h(i) = i^3 \bmod 10$

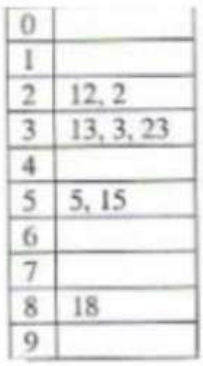
Question 2

Correct

Mark 1.00 out of 1.00

The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. What is the resultant hash table?

0	
1	
2	12
3	13
4	
5	5
6	
7	
8	18
9	



0	
1	
2	12, 2
3	13, 3, 23
4	
5	5, 15
6	
7	
8	18
9	

0	
1	
2	12
3	13
4	2
5	3
6	23
7	5
8	18
9	15

0	
1	
2	2
3	23
4	
5	15
6	
7	
8	18
9	

0	
1	
2	12
3	13
4	2
5	3
6	23
7	5
8	18
9	15

The correct answer is:

Question 3

Correct

Mark 1.00 out of 1.00

What is a hash table?

- A data structure that stores data in a linked list
- A data structure that stores data in a key-value pair and uses a hash function to compute an index into an array of buckets ✔
- A data structure that stores data in a sorted order.
- A data structure that stores data in a tree-like structure

The correct answer is:
A data structure that stores data in a key-value pair and uses a hash function to compute an index into an array of buckets

Question 4

Correct

Mark 1.00 out of 1.00

What is a collision in a hash table?

- When two different keys map to different indices in an array.
- When two different values map to the same index in an array.
- When two different values map to different indices in an array.
- When two different keys map to the same index in an array. ✔

The correct answer is: When two different keys map to the same index in an array.

Question 5

Correct

Mark 1.00 out of 1.00

Calculate $P_{3,5}(\geq 1 \text{ collision})$.

Hint: $P_{N,M}(\geq 1 \text{ collision}) = 1 - P_{N,M}(\text{no collision})$

Where N is number of insertions and M is no of slots

Input your answer in decimal form and round to the nearest 2 digits

Answer: 0.52 ✔

3 insertions into 5 slots

P(no collision 1st) = 1, all slots empty

P(no collision 2nd) = 4/5, 1 slot filled

P(no collision 3rd) = 3/5, 2 slots filled

thus P(no collisions) = 1(4/5)(3/5) = 0.48

P(≥1 collision) = 1-P(no collisions) = 1-.48 = 0.52

The correct answer is: 0.52

Question 6

Correct

Mark 1.00 out of 1.00

Hash table is?

- A structure used for storage
- A structure used to implement stack and queue
- A structure that maps values to keys
- A structure that maps keys to values ✔

The correct answer is: A structure that maps keys to values

Question 7

Correct

Mark 1.00 out of 1.00

The hash function for a hash table is
H1(k) = k % 50.
In the case of collision, the hash function used is
H(k) = (H1(k) + M x H2(k)) % 50
where H1(k) = k % 50 and H2(k) = k % 20.
M is initialized to 0 and is incremented by 1 each time a collision occurs.
This could be categorized under which of the following collision detection technique?

- Re-Hashing
- Linear Probing
- Quadratic Probing
- Double Hashing ✔

The correct answer is: Double Hashing

Question 8

Correct

Mark 1.00 out of 1.00

Match the correct Big O time complexity for following scenarios

Searching element in a sorted array	O(log n) ✔
Mergesort	O(n log n) ✔
Insertion for an array	O(n) ✔
Direct Address table insert	O(1) ✔

The correct answer is: Searching element in a sorted array → O(log n), Mergesort → O(n log n), Insertion for an array → O(n), Direct Address table insert → O(1)

Question 9

Correct

Mark 1.00 out of 1.00

Suppose we have an empty **Hash Table**, where $H(k) = k \% M$ and $M = 7$. After inserting the keys 31, 77, and 708 into our **Hash Table** (in that order), which index will the key 49 end up hashing to using the collision resolution strategy of **Linear Probing**?

Answer: 2 ✔

Collusion occurs at index 0, since index 1 is already occupied(708), the answer is 2

The correct answer is: 2

Question 10

Correct

Mark 1.00 out of 1.00

Given the following input (4322, 1334, 1471, 9679, 1989, 6171, 6173, 4199) and the hash function x mod 10, which of the following statements are true?

i. 9679, 1989, 4199 hash to the same value

ii. 1471, 6171 has to the same value

iii. All elements hash to the same value

iv. Each element hashes to a different value

- ii only
- i only
- iii or iv
- i and ii only ✔

The correct answer is: i and ii only