**Indexing Methods: Hashing Trees, Suffix Trees**

**1. Hashing Concepts**

* What is a hash function?
* What is hashing?
* Define hashing and hash collision.
* What are hashing and collision? Write about any three hashing algorithms.
* What is hashing? Why do we need hashing? Give the characteristics of a hash function.
* Write short notes on a) Hashing.
* What is rehashing and double hashing?
* What do you mean by rehashing and double hashing?
* What is open hashing?
* What do you mean by open hashing and closed hashing?
* Define Hash collision and collision resolution.

**2. Collision and Collision Resolution Techniques**

* What is collision? What are the techniques used for collision resolution in hashing?
* What are the different collision reduction techniques in hashing?
* Briefly explain different types of collision resolution techniques.
* How can the collision in hashing be reduced? Explain any one collision reduction technique.
* Explain with example the collision resolution method open hashing.
* Explain any two methods of collision resolution with reference to hashing.
* What is the cause of collision in hashing and explain any one method for collision resolution?
* How do you minimize the hash collision?
* Explain any three collision resolving schemes with examples.
* What is clustering? Explain any three collision resolving schemes with examples.
* Define clustering in rehashing method. Is it possible to remove clustering by quadratic probing? Explain.

**3. Probing Techniques**

* Discuss linear probing in detail.
* What is linear probing, quadratic probing, and double hashing?
* Discuss linear probing and quadratic probing.
* How are linear probing, quadratic probing, and double hashing techniques used to resolve a collision? Explain with a suitable example.
* Write an algorithm for collision resolution by open addressing.
* Outline an algorithm to delete a key from a hash table when the linear probing is used for inserting keys.

**4. Hash Table Construction and Examples**

* Insert elements into a hash table using the modulo division method with double hashing.
* Given a set of elements A = {3, 2, 9, 6, 11, 9, 12} and hash functions h(k) = 2k + 3 and h2(k) = 3k + 1, insert these elements into a hash table of size 10 using the division method and double hashing technique for open addressing.
* Construct a hash table of size 10 for the following set of data using linear probing, quadratic probing, and chaining with hash function X mod 10: 21, 36, 39, 42, 44, 46, 55, 66, 91, 35.
* Given input {3, 2, 9, 6, 11, 13, 7, 2} and a hash function h(k) = 2k + 3, show the resulting hash table using i. Linear Probing ii. Quadratic Probing.
* Insert the keys: 62, 37, 36, 44, 67, 91, 82, and 31 using the quadratic probing method. The hash function is h(key) = key % 10.
* Consider a hash table of size 10. Using quadratic probing, insert the keys 52, 77, 26, 44, 33, 91, and 81 into the table. (Take C1 = 1 and C2 = 3).
* Insert the keys 30, 15, 69, 28, 49, 58, 79, and 91 using the quadratic probing method. The hash function is: h(key) = key % 10.
* Consider a hash table of size 10; insert the keys 62, 37, 36, 44, 67, 91, and 107 using linear probing.

**5. Big O Notation and Algorithm Analysis**

* What is Big 'O' notation? Analyze anyone sorting algorithm.

**6. Binary Search and Other Hash Table Operations**

* Write a binary search. Consider a hash table of size 10; insert the keys 62, 37, 36, 44, 67, 91, and 107 using linear probing.

**7. Serial vs Parallel Algorithms**

* Write the difference between serial and parallel algorithm with example.