Hashing

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(i) What is Hashing?

→ Hashing is the transformation of a string of character into a usually shorter fixed-length value or key that represents the original string.

→ Hashing is used to Index & retrive Items in a Database because it is faster to find the Item using the shortest hashed key than to find it using the original value.

(ii) Hash Function

→ The mapping between an item & a slot where the item belongs in a Hash Table is called a Hash Function.

→ A hash function accepts a key & returns its Hashkey or Hashvalue.

→ Time Complexity of search time : $O(1)$

(iii) Collision

→ When two or more elements need the same slot in the Hash Table, then collision appears.

(iv) Applications of Hash Table

(a) Database System - Hash Table is an integral part of Random Access because they provide a way to locate data in a constant amount of time.

(b) Symbol Tables - Compilers access Information about Symbols frequently, therefore, it is essential that <u>symbol tables</u> be implemented very efficiently.
    ↳ tables utilized by compilers to maintain data about symbols from a program

(c) Data Dictionaries - DS that supports adding, deleting & searching for data; operation of Data Dictionary & Hash Tables are similar

(d) Associative Arrays - Data arranged so that n^{th} elements of one array correspond to the nth element of another. Associative arrays are helpful for indexing a logical grouping of data by several key fields.

(v) Methods of Hash

logical grouping of data by several key fields.

(v) Methods of Hashing - Chaining (Open Hashing)

                 - Open Addressing (Closed Hashing)

(vi) Chaining - All keys that hash into the same slot are placed in a linked list associated with that slot, this linked list is called the chain at slot.

(vii) Open Addressing - Linear Probing

                - Quadratic Probing

                - Double Hashing

(a) Linear Probing : A scheme in computer programming for resolving collision in a hash table by sequentially searching the hash table for a free location.

(b) Quadratic Probing : Open addressing scheme for resolving collisions in a hash table, where we look for the i^2'th slot in the i'th iteration if the given hash value x collides in the hash table.

(c) Double Hashing : Two hash functions are used to compute the final hash value. The first hash function is used to compute the initial hash value of the second hash function is used to compute the step size for the probing sequence.