

# \* Data Structures and Algorithms (DSA) - Assignment Number - 1

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Q-1. What is hashing? Explain different methods of hash function calculation.

→ Hashing:-

Hashing is a technique which use less key comparisons and search the element in  $O(n)$  times in the worst case and in an average case it will be done in  $O(1)$  time. This method generally used the hash function to map the key into a table, which is called a hash table.

Types of hash function:-

① Division method-

In this the hash function is dependent upon the remainder of a division. For example:- if the record 52, 68, 99, 84, is to be placed in a hash table and let us take the table size is 10.

Then:-  $h(\text{key}) = \text{record} \% \text{table size}$

$$2 = 52 \% 10$$

$$9 = 99 \% 10$$



### ③ Mid Square method:-

In this method firstly key is squared and then mid part of the result is taken as the index. For example:-

Consider that if we want to place a record of 3101 and the size of table is 1000. So  $3101^2 = 9616201$  i.e.  $h(3101) = 162$  (middle 3 digit)

### ③ Digit folding method:-

In this method the key is divided into separate parts and by using some simple operations these parts are combined to produce a hash key. For example: consider a record of 124,655,12 then it will be divided into parts i.e. 124, 655, 12

After dividing the part combine these parts by adding it.

$$H(\text{key}) = 124 + 655 + 12 \\ = 791.$$

Q - 2. Construct Hash Table of size 15 and resolve collision using open addressing technique linear probing and use hash function  $h(n) = n \bmod 15$ .  
35, 36, 25, 47, 2501, 129, 65, 29, 16, 14, 99

→  $35 \% 15 = 5$ ,  $\therefore$  Place 35 on 5th position of hash table.  
 $36 \% 15 = 6$ ,  $\therefore$  Place 36 on 6th position of hash table.  
 $25 \% 15 = 10$ ,  $\therefore$  Place 25 on 10th position of hash table.  
 $47 \% 15 = 2$ ,  $\therefore$  Place 47 on 2nd position of hash table.  
 $2501 \% 15 = 11$ ,  $\therefore$  Place 2501 on 11th position of hash table.



$$65 \% 15 = 5 \leftarrow \text{collision}$$

$\therefore$  Using Linear position check next free location linearwise.  
As 7th is next free location place 65 on 7th location of hash Table.

$$29 \% 15 = 14, \therefore \text{Place } 29 \text{ on } 14\text{th position of hash table.}$$

$$16 \% 15 = 1, \therefore \text{Place } 16 \text{ on } 1\text{st position of hash table.}$$

$$14 \% 15 = 14 \leftarrow \text{collision}$$

$\therefore$  Using Linear probing check next free location linearwise.  
As 0th is next free location  $\therefore$  place 14 on 0th location of hash table.

$$99 \% 15 = 9 \leftarrow \text{collision}$$

$\therefore$  Using Linear probing check next free location linearwise.  
As 12th is next free location  $\therefore$  Place ~~99~~ <sup>99</sup> on 12th location of hash table.

0	14
1	16
2	47
3	
4	
5	35
6	36
7	65
8	
9	129
10	25
11	2501
12	99
13	
14	29

$\therefore$  The hash table is as follows:-