UNIT - IV

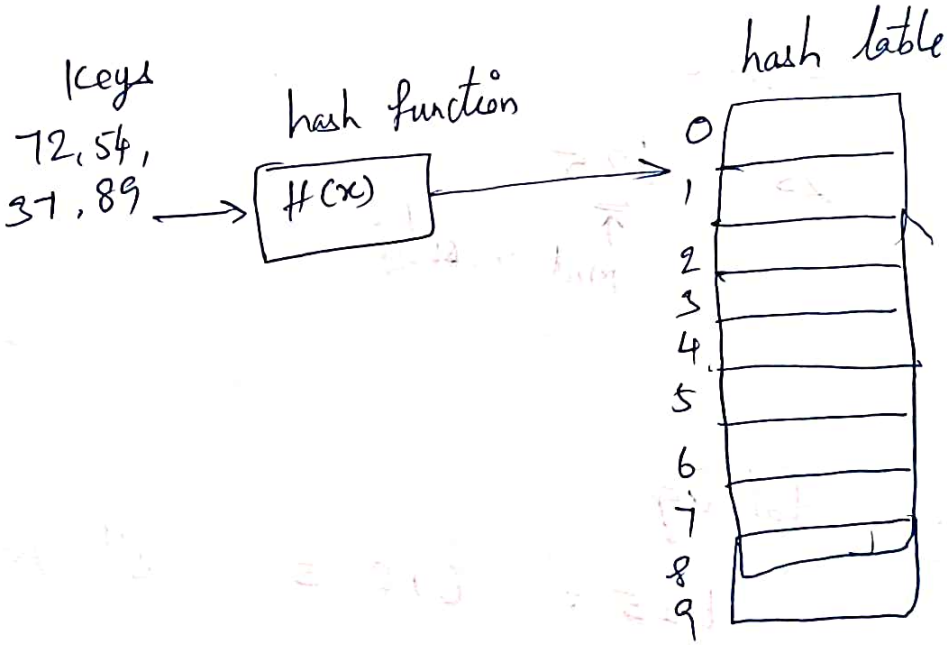
Hashing:

→ It is a DS

→ It is a technique of mapping large chunk of data into small tables using a hashing function.

→ Also known as message digest function.

Eg:



Hash function

→ Put data into table

→ Types

① Division method

② Mid square

③ Digit folding.

① Division Method:

H(key) = key % Tablesize

eg: H(54) = 54 % 10 = 4

H(72) = 72 % 10 = 2

H(37) = 37 % 10 = 7

H(89) = 89 % 10 = 9

② Mid square

$25^2 = 625$

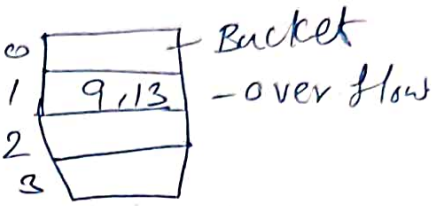
mid position

③ Digit folding

625 = 6+2+5 = 13th position

Collision

Key : 9, 13. H(x) →



9 % 4 = 1

13 % 4 = 1

'9' will be deleted.

Techniques to avoid collision

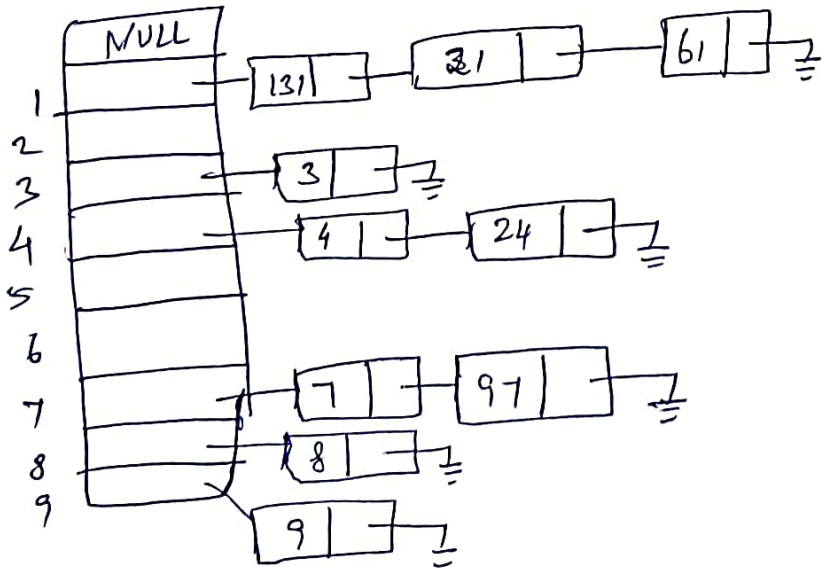
① separate chaining / External hashing

② open addressing / closed hashing

Separate chaining

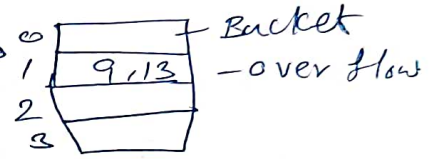
Eg.:

131, 3, 4, 21, 61, 24, 7, 97, 8, 9



Collision

Key : 9, 13. H(x) →



$9 \% 4 = 1$

$13 \% 4 = 1$

'9' will be deleted.

Techniques to avoid collision

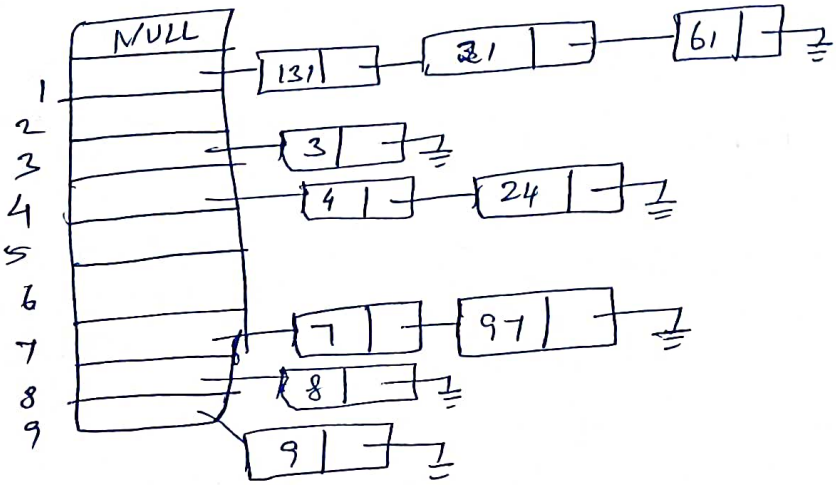
① separate chaining / External hashing

② open addressing / closed hashing

separate chaining

Eg:

131, 3, 4, 21, 61, 24, 7, 97, 8, 9



→ An additional field with data i.e chain

→ separate chain table is maintained for colliding data.

Open Addressing

Three types of collision resolution strategies.

Linear Probing

Quadratic " $[hash(x)+i^2]\%$ HTS

Double hashing

0
1
4
9

Linear Probing:

89, 18, 49, 58, 69

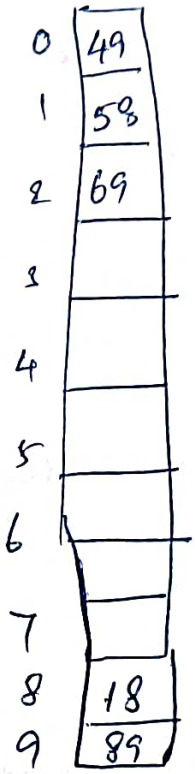
$h_i(x) = (Hash(x)+i)$ % Hashtablesize

if $h_0 = (Hash(x)+0)$ % HTS is full we try for h_1

$h_1 = (Hash(x)+1)$ % " " " " h_2

So on.

Eg:- 89, 18, 49, 58, 69



① Insert 89

$h_0(89) = (89 \% 10) = 9$

② Insert 18

$h_0(18) = (18 \% 10) = 8$

③ Insert (49)

$h_0(49) = (49 \% 10) = 9$

collison.

$h_1(49) = (49 + 1 \% 10)$

$50 \% 10 = 0$

④ Insert 58

$h_0(58) = (58 \% 10) = 8$ full calculate h_1

$h_1(58) = (59 \% 10) = 9$ " " h_2

$h_2(58) = (60 \% 10) = 0$ " " h_3

$h_3(58) = (58 + 3) \% 10 = 1$

$61 \% 10$

⑤ Insert 69

$h_0(69) = 69 \% 10 = 9$ occupied calculate h_1

$h_1(69) = 69 + 1 \% 10 = 0$ " " h_2

$h_2(69) = 69+2 \% 10 = 1$ occupied, Calculate h_3

$h_3(69) = 69+3 \% 10$

$72 \% 10 = 2$ place the value

Double Hashing:

$$h_i(x) = hash(x) + i * (Hash_2(x)) \% HTS$$

Quadric :

$$h_i(x) = (hash(x) + i^2) \% Hash\ table\ size.$$