UNIT-II

DOUBLE HASHING:

Double hashing uses the idea of applying a second hash function to the key when a collision occurs. The result of the second hash function will be the number of positions from the point of collision to insert.

There are a couple of requirements for the second function:

- ✓ It must never evaluate to 0
- ✓ Must make sure that all cells can be probed

A popular second hash function is : $H_2(key) = R - (key \% R)$

Where R is a prime number that is similar than the size of the table

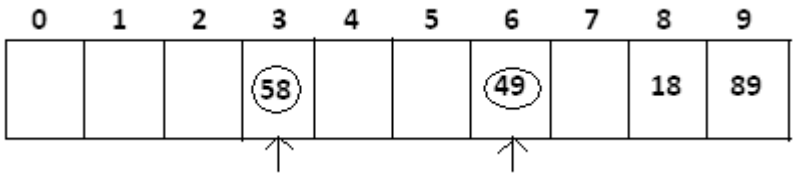

Table size = 10

$Hash_1(key) = key \% 10$

$Hash_2(key) = 7 - (key \% 7)$

Because 7 is a prime number than the size of the table

Insert keys: 89, 18, 49, 58, 69

Hash (89) = 89 % 10 = 9

Hash (18) = 18 % 10 = 8

$Hash_1$ (49) = 49 % 10 = 9; it's a collision

$Hash_2(49) = 7 - (49 \% 7) = 7$; positions from location 9

$Hash_1$ (58) = 58 % 10 =8; it's a collision

$Hash_2$ (58) = 7 – (58 % 7) = 5; positions from location 8

NOTE:

Linear probing → 'm' distinct probe sequences, primary clustering

Quadratic probing → 'm' distinct probe sequences, no primary but secondary clustering

Double hashing → 'm^2' distinct probe sequences, no primary and secondary clustering

Key – offset:

It is double hashing method that produces different collision paths for different keys. Where as the pseudo random – number generator produces a new address as a function of the previous address; key offset calculates the new address as a function of the old address and key.

One of the simplest versions simply adds the quotient of key divided by the list size to the address to determine the next collision resolution address, as shown below

Offset = $\lfloor$ key / list size $\rfloor$

Address = ((offset + old address) modulo list size))

For example:

The key is 166702 and list size is 307, using modulo - division hashing method generates an address of 1. It's a collision because there was a key 070918.

Using key offset to calculate the next address, we get 237 as shown below

Offset = $\lfloor$166702 / 307$\rfloor$ = 543

Address = ((543 + 001)) modulo 307 = 237

If 237 were also a collision, we would repeat the process to locate the next address, as shown below

Offset = $\lfloor$166702 / 307$\rfloor$ = 543

Address = ((543 + 237)) modulo 307 = 166

If it is free, then place the key in this address.