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CS 590 Homework 5: Reinforcement Exercises

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Problem 6.7.4:

Given Hash function is h(i)=(2i+5)mod 11

Given hash keys are 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, 5.

A) Assuming collisions are handled cy chaining then the 11-item hash table is:

The 11-item hash table is:

H[0]=null
H[1]→ 20
H[2]=null
H[3]=null
H[4]→ 16,5
H[5]→44, 88, 11
H[6]→ 94,39
H[7]→ 12,23
H[8]=null
H[9]→ 13

H[10]=null

In this method of collision resolution by chaining the ith entry in hash table H[0:m-1], i=0,….m-1, does not contain a key but instead contains a pointer to a linked list of keys, all of which satisfy h(k)=i.

Explanation: h(12)= (2*12+5) mod 11= 29 %11=7
Hence 12 is at location 7
h(5)= (2*5+5)mod 11= 15 %11=4
Hence 5 is at location 4 and so ON

<u>Problem 6.7.7:</u>

From the hash function result above, we can see all the indices where there are multiple elements. These are the position we need to resolve by double hashing.

Lets move element by element in order 12, 44, 13, 88, 23, 94, 11, 39, 20, 16,5

12 - This element was the first element to hash into index 8 so no need to do anything and it will remain at the position.

44 - Like element 12, 44 is the first element to hash into index 5.

13 - Like 12 and 44, 13 will remain at its index.

88 - At index 5, there is already an element 44 so we will apply double hash function 7 - (88 mod 7) = 3. We move 88 by adding 3 to its current index i.e 5 + 3=8. Because index 8 is already occupied, we move 88 further 3

positions. (8 + 3) % 11 =0. Index 0 is again occupied, so 0 + 3 =3 now 3 index is empty so we put 88 at position 3.

23 - Index 8 is already occupied by 12 so we apply double hashing funcion and we get 5. Now move 5 position further to it current position i.e 8+5%11=2. We are taking mod of 11 to keep it under 0 to 10 index. So new position is 2.

94 - It will remain at its position 1 because it is empty.

11 - Its new position will be index 6 because at its current position , there is already an element so by applying double hash function we get 7-11%7=3. Now we move 3 positions further until we get a vacant new position. so first we move 5+3%11=8, then we move 8+3%11=0, then 0+3%11, then 3+3%11=6 . 6 position is empty so we move element 11 to position 6.

39 - We will apply double hashing because its current position is already occupied. We get 7-(39%7)=3. So we move 3 positions. we get 1+3%11 = 4. Its new position would be 4 because it is empty.

20- It will remain at its position.

16- It will remain at its same position.

5 - Similarly 5 new position would be 7.

0	13
1	94
2	23
3	88
4	39
5	44
6	11
7	5
8	12
9	16
10	20