

Department of Computer Science and Engineering

National Sun Yat-sen University

Data Structures Quiz, Chapters 8, Dec. 2, 2024

1. Describe the linear probing technique used to resolve hash collisions when a hash table is established. (20%)
2. Suppose that the hash functions $h(k)\%b$, $(h(k)+i^2)\%b$, and $(h(k)-i^2)\%b$, where $i=1, 2, \dots$, are used to calculate the table index of a key k sequentially, if there is a collision. Assume that $h(k) = k \% b$ and $b=13$. Please draw the hash table after inserting the followings keys: 19, 32, 5, 29, 18, 58. (30%)
3. Suppose that there are ten elements whose hashing function is given as follows:

k	$h(k)$	k	$h(k)$
A0	100 000	B5	101 101
A1	100 001	C1	110 001
B0	101 000	C2	110 010
B1	101 001	C3	110 011
B4	101 100	C5	110 101

The directoryless dynamic hash table is used to insert the above elements, where each bucket has two slots. Initially, suppose that some elements have been inserted into the hash table as follows:

00	B4, A0
01	A1, B5
10	C2, -
11	C3, -

- (a) Please show the hash table after the next element C5 is inserted. (25%)
- (b) Please show the hash table after the next elements C5 and C1 are inserted. (25%)

Answers:

1. Linear probing is also called linear open addressing. The method is to search the next available bucket one by one. If the hash collision occurs, the algorithm checks the next position in the table until it finds an empty bucket to insert the element.

2.

0	
1	
2	
3	29
4	18
5	5
6	19
7	32
8	
9	
10	58
11	
12	

3.

(a)

000	A0, -
001	A1, B5
010	C2, -
011	C3, -
100	B4, -

Overflow
bucket

C5

(b)

000	A0, -
001	A1, C1
010	C2, -
011	C3, -
100	B4, -
101	B5, C5