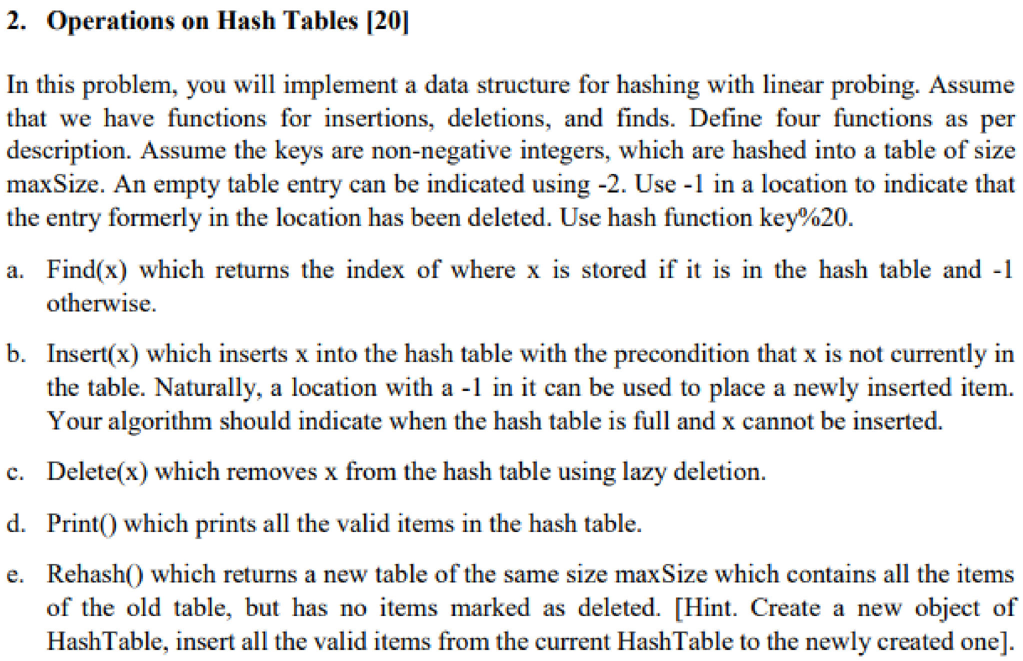
Operations on Hash Tables [20] In this problem, you will implement a data structure for hashin...



2. Operations on Hash Tables [20]

In this problem, you will implement a data structure for hashing with linear probing. Assume that we have functions for insertions, deletions, and finds. Define four functions as per description. Assume the keys are non-negative integers, which are hashed into a table of size maxSize. An empty table entry can be indicated using -2. Use -1 in a location to indicate that the entry formerly in the location has been deleted. Use hash function key%20.

a. Find(x) which returns the index of where x is stored if it is in the hash table and -1 otherwise.

b. Insert(x) which inserts x into the hash table with the precondition that x is not currently in the table. Naturally, a location with a -1 in it can be used to place a newly inserted item. Your algorithm should indicate when the hash table is full and x cannot be inserted.

c. Delete(x) which removes x from the hash table using lazy deletion.

d. Print() which prints all the valid items in the hash table.

e. Rehash() which returns a new table of the same size maxSize which contains all the items of the old table, but has no items marked as deleted. [Hint. Create a new object of HashTable, insert all the valid items from the current HashTable to the newly created one].

Solve this question by using C++ Language

Show transcribed image text

Expert Answer

- Anonymous answered this

  Was this answer helpful?

  0

  0

  4 answers

  I am doing this code for implementing the above problam with the linear proving.

  Program:

```
#include <iostream>
#include <cstdio>
#include <cstdlib>
using namespace std;
const int T_S = 5;
class HashTable {
public:
int k;
int v;
HashTable(int k, int v) {
this->k = k;
this->v = v;
}
};
class DelNode:public HashTable {
private:
static DelNode *en;
DelNode():HashTable(-1, -1) {}
public:
static DelNode *getNode() {
if (en == NULL)
en = new DelNode();
return en;
}
};
DelNode *DelNode::en = NULL;
class HashMapTable {
private:
HashTable **ht;
public:
HashMapTable() {
ht = new HashTable* [T_S];
for (int i = 0; i < T_S; i++) {
ht[i] = NULL;
}
}
int HashFunc(int k) {
return k % T_S;
}
void Insert(int k, int v) {
int hash_val = HashFunc(k);
int init = -1;
int delindex = -1;
while (hash_val != init && (ht[hash_val] == DelNode::getNode() || ht[hash_val] != NULL
&& ht[hash_val]->k != k)) {
if (init == -1)
init = hash_val;
if (ht[hash_val] == DelNode::getNode())
delindex = hash_val;
hash_val = HashFunc(hash_val + 1);
}
if (ht[hash_val] == NULL || hash_val == init) {
if(delindex != -1)
ht[delindex] = new HashTable(k, v);
else
ht[hash_val] = new HashTable(k, v);
}
if(init != hash_val) {
if (ht[hash_val] != DelNode::getNode()) {
if (ht[hash_val] != NULL) {
if (ht[hash_val]->k== k)
ht[hash_val]->v = v;
}
} else
ht[hash_val] = new HashTable(k, v);
}
}
int SearchKey(int k) {
int hash_val = HashFunc(k);
int init = -1;
while (hash_val != init && (ht[hash_val] == DelNode::getNode() || ht[hash_val] != NULL
&& ht[hash_val]->k!= k)) {
if (init == -1)
init = hash_val;
hash_val = HashFunc(hash_val + 1);
}
if (ht[hash_val] == NULL || hash_val == init)
return -1;
else
return ht[hash_val]->v;
}
void Remove(int k) {
int hash_val = HashFunc(k);
int init = -1;
while (hash_val != init && (ht[hash_val] == DelNode::getNode() || ht[hash_val] != NULL
&& ht[hash_val]->k!= k)) {
if (init == -1)
init = hash_val;
hash_val = HashFunc(hash_val + 1);
}
if (hash_val != init && ht[hash_val] != NULL) {
delete ht[hash_val];
ht[hash_val] = DelNode::getNode();
}
}
~HashMapTable() {
delete[] ht;
}
};
int main() {
```

```
HashMapTable hash;
int k, v;
int c;
while(1) {
cout<<"1.Insert element into the table"<<endl;
cout<<"2.Search element from the key"<<endl;
cout<<"3.Delete element at a key"<<endl;
cout<<"4.Exit"<<endl;
cout<<"Enter your choice: ";
cin>>c;
switch(c) {
case 1:
cout<<"Enter element to be inserted: ";
cin>>v;
cout<<"Enter key at which element to be inserted: ";
cin>>k;
hash.Insert(k, v);
break;
case 2:
cout<<"Enter key of the element to be searched: ";
cin>>k;
if(hash.SearchKey(k) == -1) {
cout<<"No element found at key "<<k<<endl;
continue;
} else {
cout<<"Element at key "<<k<<" : ";
cout<<hash.SearchKey(k)<<endl;
}
break;
case 3:
cout<<"Enter key of the element to be deleted: ";
cin>>k;
hash.Remove(k);
break;
case 4:
exit(1);
default:
cout<<"\nEnter correct option\n";
}
}
return 0;
}
```