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| **CSE 331** | **Semester** |

Project XX

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**Assignment Overview**

Your job is to implement a Hash Table class. The table will be used to store strings representing usernames and passwords.

**Assignment Deliverables**

* hashtable.py

Be sure to use the specified file name(s) and to submit your files for grading **via D2L Dropbox** before the project deadline.

**Assignment Specifications**

Your task will be to complete the methods listed below.

\_\_str\_\_

* Given
* Provides a string representation of the stack

\_\_setitem\_\_

* Calls the setitem method
* Time complexity O(1)
* Space complexity O(1)

\_\_getitem\_\_

* Calls the get method
* Time complexity O(1)
* Space complexity O(1)

\_\_delitem\_\_

* Calls the delete method
* Time complexity O(1)
* Space complexity O(1)

\_\_len\_\_

* Given
* Returns the number of items in the hash table

Setitem

* Adds a node of a given value with a key associated with that node to the hash table using the result of python’s hash function of the key modulo the capacity of the hash table as the index of the list to append to. Visual representation: [ {key: Node(key, value)}]
* If the lambda of the hash table gets to be above 2/3 then calls the grow function before adding the node.
* Time complexity: O(1)\*
* Space complexity O(1)\*

Delete

* Removes the item with the given key from the hash table
* Time complexity: O(1)
* Space complexity: O(1)

Get

* Searches the hash table for a given key and returns the value of that key
* Time complexity: O(1)
* Space complexity O(1)

\_\_iter\_\_

* Traverses through the hash table yielding each item in the table in the order of the index of the table
* Time complexity: O(N)
* Space complexity: O(1)

grow

* Doubles the size of the hash table and reorganizes the nodes into their new proper lists
* Time complexity: O(N)
* Space complexity: O(N)

capacity

* Returns the current capacity of the hash table
* Time complexity O(1)
* Space complexity O(1)

\* refers to amortized time, or average case performance when the operation is done many times.

Normally, adding to the hash table takes constant time, until the case where lambda is over 2/3 in which case you must grow the hash table. Each grow operation takes O(N) time.

You may make additional helper functions if necessary.

**Assignment Notes**

Enter any additional instructions here:

Example:

Points will be deducted if your solution has any warnings of any type:

* The newest distribution python 3.6 interpreter will be used to execute your solution.
* To test your classes, main.py is provided. Compare your results to the output below.
* You may not change any function signatures in anyway, which include class definitions.
* You are required to complete the docstring for any unmade and created function signatures
* To test your classes, main.py is provided. Compare your results to the output below.
* Your solutions will be tested against 5 test cases checking for various edge cases.

Testing your work

Run your project on Pycharm see sample run below

Below are the results for testcases 1 through 3

-----TEST 1-----

Table: Size: 4 Capacity: 11

{ [ ios:superior, android:meh, windows:lol ], [ ], [ ], [ ], [ user1:password ], [ ], [ ], [ ], [ ], [ ], [ ] }

Get Item: ios:superior

Updated Table: Size: 5 Capacity: 11

{ [ ios:superior, android:meh, windows:lol ], [ ], [ blackberry:huh? ], [ ], [ user1:password ], [ ], [ ], [ ], [ ], [ ], [ ] }

-----TEST 2-----

Table: Size: 5 Capacity: 11

{ [ ], [ Facebook:NSA ], [ ], [ ], [ ], [ ], [ Chevron:DrillBabyDrill, Intel:TSMC ], [ ], [ user2:password, Amazon:Seattle ], [ ], [ ] }

Get Item: Chevron:DrillBabyDrill

Get Item: Facebook:NSA

Get Item: None

Updated Table: Size: 3 Capacity: 11

{ [ ], [ ], [ ], [ ], [ ], [ ], [ Intel:TSMC ], [ ], [ user2:password, Amazon:Seattle ], [ ], [ ] }

-----TEST 3-----

Table: Size: 9 Capacity: 22

{ [ ], [ ], [ ], [ ], [ ], [ ], [ user3:password3, Obama:Drones, Trump:Drumpf ], [ Elvis:HeyMama ], [ Brittney:LeaveHerAlone ], [ ], [ Hawkings:Radiation ], [ ], [ Bond:James ], [ ], [ ], [ ], [ ], [ ], [ ], [ ChrisBrown:Rhianna, Nixon:Watergate ], [ ], [ ] }

Get Item: Nixon:Watergate

Get Item: Elvis:HeyMama

Updated Table: Size: 6 Capacity: 22

{ [ ], [ ], [ ], [ ], [ ], [ ], [ Obama:Drones ], [ Elvis:HeyMama ], [ ], [ ], [ Hawkings:Radiation ], [ ], [ Bond:James ], [ ], [ ], [ ], [ ], [ ], [ ], [ ChrisBrown:Rhianna, Nixon:Watergate ], [ ], [ ] }