

**CS 201 – Data Structures II (L2), Spring 2024**  
**Quiz # 4**

Name: \_\_\_\_\_

ID: \_\_\_\_\_

**Q1** – Draw the 11-entry hash table that results from using the hash function,  

$$h(i) = (3i + 5) \bmod 11,$$

to hash the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, and 5, assuming collisions are handled by schemes given in part b - d.

a) [2 points] Compute hash of each value.

[illegible]

b) [2 points] quadratic probing

[illegible]

c) [2 points] double hashing using the secondary hash function  $h'(x) = 7 - (k \bmod 7)$

[illegible]

**Q-2.** [2 points] What is the worst-case time for putting  $n$  entries in an initially empty hash table, with collisions resolved by chaining? What is the best case? Justify.

**Q-3** [2 points] Assuming that there are no collisions, hash tables allow insertions in  $O(1)$  time. If a hash table is implemented using a dynamic array (that get doubled when it is full), what do you think is the amortized cost of adding an element to the hash table? Justify your answer.

**Q-4.** [2 points] What is secondary clustering? Why can open addressing with quadratic probing possibly result in secondary clustering?

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