Department of Computer Science,
Data Structures (CSC212),
Tutorial 13
Hashing

Question 1.
Use the hash function **H**(key) = key mod 11 to store the sequence of integers: 82, 31, 28, 4, 45, 27, 59, 79, 35 in the hash table of TableSize = 11. (a) Use linear rehashing (b) Use external chaining (c) Use coalesced chaining with a cellar size of four and the hash function H(key) = key mod 7.
For each of the collision resolution strategies determine (after the values have been inserted into the table) the following:

1) The average number of probes needed to find a value that is in the table
2) The average number of probes needed to find a value that is not in the table.

Question 2.
Assuming the keys are integers, denoted by $d_n d_{n-1} \ldots d_k \ldots d_2 d_1$ where d_i is the *i*-th decimal digit in the key, d_n being the leftmost decimal digit. The hash function *H(key)* is given by:

$$H(key) = (d_1 d_2 + d_{n-1} d_n + d_k) \bmod 11$$

where $d_1 d_2$ is a two digit number (composed by swapping the rightmost two digits), $d_{n-1} d_n$ is also a two digit number (composed by swapping the leftmost two digits), and $k = \lceil n/2 \rceil$. For example:

$$H(70934) = (43 + 07 + 9) \bmod 11 = 59 \bmod 11 = 4.$$

Assume the keys are: 1234, 519, 911, 7346, 0, 999, 99834, 54 and 40015.

(a) Compute *H(key)* for each of the above keys.
(b) Insert the above keys (in exactly the same order) in a hash table with open addressing (linear rehashing).
(c) Find the number of probes required to search for keys 54 and 11 in the above hash table.
(d) Repeat part (b) using an external chaining hash table.

Question 3.
Develop a hashing function to convert a character key of 15 characters into integers in the range of 0 to 999.