CPSC 6109 Algorithms Analysis and Design

Assignment 03: Hashing

Possible points: 55

1. Use the table below to convert a character key to an integer for the following questions.

Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Key	0	1	2	3	4	5	6	7	8	9	10	11	12
Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Key	13	14	15	16	17	18	19	20	21	22	23	24	25

   Give the contents of the hash table that results when the following keys are inserted in that order into an initially empty 13-item hash table: (E_1, A, S_1, Y, Q, U, E_2, S_2, T, I, O, N). Use $h(k) = k \bmod 13$ for the hash function for the k-th letter of the alphabet (see above table for converting letter keys to integer values). Use double hashing and let $h'(k) = 1 + (k \bmod 11)$ be the secondary hash function. **[15 points]**

2. Professor Marley hypothesizes that he can obtain substantial performance gains by modifying the chaining scheme to keep each list in sorted order. How does the professor's modification affect the running time for successful searches, unsuccessful searches, insertions, and deletions**?** **[15 points]**
3. Using the following strategies, and given a hash table with 7 entries, draw the hash table and it's contents after inserting the following numbers: 7, 11, 71, 42, 13, 49: **[25 points]**
   (a) Separate chaining
   (b) Linear probing
   (c) Quadratic probing
   (d) Double hashing

   Calculate the load factor α for each of the strategies.

Submission

Please submit all the answers in a single PDF file.

If you submit HANDWRITTEN answers, please make sure they are clear to read. Otherwise, points will be deducted.