

## Question - 1

SCORE: 5 points

Consider a hash table with 100 slots. Collisions are resolved using chaining. Assuming simple uniform hashing, what is the probability that the first 6 slots are unfilled after the first 3 insertions?

- ☒  $(94 \times 94 \times 94) / (100^3)$
- ☐  $(96 \times 95 \times 94) / (100^3)$
- ☐  $(94 \times 93 \times 92) / (100^3)$
- ☐  $(94 \times 93 \times 92) / (3! \times 100^3)$

## Question - 2

SCORE: 5 points

Which one of the following hash functions on integers will distribute keys most uniformly over 10 buckets numbered 0 to 9 for  $i$  ranging from 0 to 2020?

- ☐  $h(i) = (12 * i) \bmod 10$
- ☐  $h(i) = (i^2) \bmod 10$
- ☐  $h(i) = (3 * i^2) \bmod 10$
- ☒  $h(i) = (i^3) \bmod 10$

## Question - 3

SCORE: 5 points

A hash table of length 10 uses open addressing with hash function  $h(k) = k \bmod 10$ , and linear probing. After inserting 6 values into an empty hash table, the table is as shown below. Which one of the following choices gives a possible order in which the key values could have been inserted in the table?

0	
1	
2	42
3	23
4	34
5	52
6	46
7	33
8	
9	

- ☐ 46, 42, 34, 52, 23, 33

- ☒ 46, 34, 42, 23, 52, 33
- ☐ 42, 46, 33, 23, 34, 52
- ☐ 34, 42, 23, 52, 33, 46

#### Question - 4

SCORE: 5 points

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An advantage of chained hash table (external hashing) over the open addressing (linear probing) scheme is

- ☐ Space used is less
- ☒ Deletion is easier
- ☐ Worst case complexity of search operations is less
- ☐ None of the above

#### Question - 5

##### Linear Probing Hash Table

SCORE: 30 points

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Please implement the put and get methods for a linear probing hash table.