Assignment - 5 - Solution

(1) Answer - (c)

Explanation - Using hash function $h(x) = x \bmod 10$.

$h(9679) = 9 = h(1989) = h(4199)$

$h(1471) = h(6171) = 1$

Therefore, statement (I) and (II) are correct which match with option (c).

(2) Answer - (b)

Explanation - A hash table is used to implement associated arrays which has a key-value pair, so the has table maps keys to values.

(3) Answer - (c)

Explanation - Given that, $h(x) = (ord(x) - ord(A) + 1) \bmod 10$

$h(K) = ((11-1)+1) \bmod 10 = 1$

$h(R) = (18-1+1) \bmod 10 = 8$

$h(P) = (16-1+1)$ " " $= 6$

$h(C) = (3-1+1)$ " " $= 3$

$h(S) = (19-1+1)$ " " $= 9$

$h(N) = (14-1+1)$ " " $= 4$

$h(Y) = (25-1+1)$ " " $= 5$

$h(T) = (20-1+1)$ " " $= 0$

$h(J) = (10-1+1)$ " " $= 0$

$h(M) = (13-1+1)$ " " $= 3$

Only J and M are causing the collision.

(4) Answer - (a)

Explanation - In uniform hashing, the function evenly distributes keys into slots of hash table. Also, each key has an equal probability of being placed into a slot, being independent of the other elements already placed. Therefore, the probility of remaining first 3 slots empty for first insertion (choosing 4 to 100 slots) = 97/100.

As next insertions are independent on previous insertion, the probility for next insertions will also be 97/100. The required probability = $(97/100)^3$.

(5) Answer - (b)

Explanation - In division method for creating hash functions, k keys are mapped into one of m slots by taking the remainder of k divided by m.

(6) Answer - (b)

Explanation - In uniform distribution, the function evenly distributes keys into slots of hash table. For given hash functions, we have calculated hash values for keys 0 to 9 as:

Key	$i^2 \bmod 10$	$i^3 \bmod 10$	$11 \cdot i^2 \bmod 10$	$12 \cdot i \bmod 10$
0	0	0	0	0
1	1	1	1	2
2	4	8	4	4
3	9	7	9	6
4	6	4	6	8
5	5	5	5	0
6	6	6	6	2
7	9	3	9	4
8	4	2	4	6
9	1	9	1	8

(7) Answer - (a)

(8) Answer - (c)

Explanation - In a hash table, if several elements are computing for the same bucket then

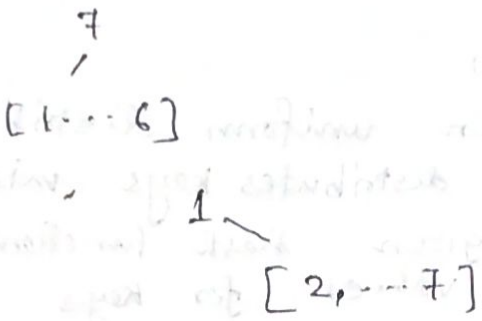
there will be a a clash among elements. This condition is called collision.

(9) Answer - (c)

Explanation - To get right 6, we need to put either 1 or 7 at root.

So, count can be written as

$T(n) = 2\,T(n-1)$ with $T(1) = 1$



Therefore the count is $2^6 = 64$.

(10) Answer - (a)