Summary in Graph

Exam Summary (GO Classes Test Series 2024 | Data Structures | Test 5)

Qs. Attempted:	**13** 4 + 9	**Correct Marks:**	**16** 4 + 12
Correct Attempts:	**10** 4 + 6	**Penalty Marks:**	**0.67** 0 + 0.67
Incorrect Attempts:	**3** 0 + 3	**Resultant Marks:**	**15.33** 4 + 11.33

Total Questions:	**15** 5 + 10
Total Marks:	**25** 5 + 20
Exam Duration:	45 Minutes
Time Taken:	45 Minutes

EXAM RESPONSE | EXAM STATS | FEEDBACK

Technical

Q #1 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Algorithms

Suppose we use a hash function h to hash n distinct keys into an array T of length m. Say that two distinct keys x, y collide under h if $h(x) = h(y)$. Assuming simple uniform hashing - that is, with each key mapped independently and uniformly to a random bucket - what is the probability that a given pair x, y of distinct keys collide?

A. $\frac{1}{m-1}$
B. $\frac{1}{m}$
C. $\frac{1}{n^2}$
D. $\frac{1}{m^2}$

Your Answer: B | **Correct Answer: B** | Correct | Discuss

Q #2 | Multiple Select Type | Award: 1 | Penalty: 0 | Algorithms

Let we insert the values $74, 924, 83, 113$, and 5 in the given order into a hash table of size 10, using the hash function $k\%10$ and resolving collisions with quadratic probing. Determine which items we would encounter in order to search for the value 65?

A. 924
B. 5
C. 83
D. 113

Your Answer: A;B | Correct Answer: A;B | Correct | Discuss

Q #3 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Algorithms

Suppose M randomly selected keys are hashed into the range $[0 \ldots \mathrm{N}-1]$ using a uniformly distributed hashing function. What is the probability that all M keys yield the same hash value (so all M keys collide at the same slot)?

A. $\dfrac{1}{\mathrm{N}^{\mathrm{M}-1}}$
B. $\dfrac{1}{\mathrm{N}^{\mathrm{M}}}$
C. $\dfrac{\mathrm{M}}{\mathrm{N}^{\mathrm{M}}}$
D. None of these

Your Answer: A | Correct Answer: A | Correct | Discuss

Q #4 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Algorithms

Suppose k randomly selected keys are hashed into the range $[0 \ldots n-1]$ using a uniformly distributed hashing function. Assume that $k \leq n$. What is the probability that all k keys yield distinct hash values (so no collisions occur)?

A. $\dfrac{(n-1)!}{(n-k)!n^{k-1}}$
B. $\dfrac{(n-1)!}{(n-(k-1))!n^{k}}$
C. $\dfrac{n!(k-1)}{(n-(k-1))!n^{k}}$
D. None of these

Your Answer: A | Correct Answer: A | Correct | Discuss

Q #5 | Numerical Type | Award: 1 | Penalty: 0 | Algorithms

Assuming the simple uniform hashing is implemented into a hash table with $m=3$ slots. What is the probability for a key to map to slot 1 given that key does not map to slot 0?

Your Answer: | Correct Answer: 0.5 | Not Attempted | Discuss

Q #6 | Numerical Type | Award: 2 | Penalty: 0 | Algorithms

Given a hashing table of 10 entries, the hash function $h(x) = x \bmod (10)$ and the input sequence

$$\{71, 23, 73, 99, 44, 79, 89\}$$

What will be the load factor of the hash table when collisions are resolved with open addressing and linear probing?

Your Answer: 1.1 | **Correct Answer: 0.7** | Incorrect | Discuss

Q #7 | Multiple Select Type | Award: 2 | Penalty: 0 | DS

Which of the following is is/are true?

A. After hashing n keys into a hash table of size m that uses chaining to handle collisions, we hash two new keys k_1 and k_2. Under the simple uniform hashing assumption, the probability that k_1 and k_2 are hashed into the same table location is exactly $1/m$ with no dependence on the number of keys n.
B. Under the uniform hashing assumption, if we use a hash table of size m with open addressing to hash 3 keys, the probability that the third inserted key needs exactly three probes before being inserted into the table is exactly $\frac{2}{m(m-1)}$.
C. We use a hash table of size m with open addressing to hash n items. Under the uniform hashing assumption, the expected cost to insert another element into the table is at most $1 + \alpha$, where $\alpha = n/m$ is the average load.
D. Linear probing is equivalent to double hashing with a secondary hash function of $h_2(k) = 1$.

Your Answer: A;C;D | **Correct Answer: A;B;D** | Incorrect | Discuss

Q #8 | Numerical Type | Award: 2 | Penalty: 0 | Algorithms

Consider an open-address hash table with uniform hashing. What is the minimum integer upper bound on the expected number of probes in an unsuccessful search when the load factor is $3/4$.

Your Answer: | **Correct Answer: 4** | Not Attempted | Discuss

Q #9 | Numerical Type | Award: 2 | Penalty: 0 | Algorithms

If we have a linear probe hash table of size $\mathrm{M} = 30$, and a cluster of size $\mathrm{C} = 14$, the probability that a random key will be inserted into the location immediately after the cluster is ________.

Your Answer: 0.5 | **Correct Answer: 0.5** | Correct | Discuss

Q #10 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

Consider a hash table of 9 slots implemented with linear probing. Suppose we insert 2 elements in a sequence to a hash table with a simple uniform hashing assumption. What is the probability that we end up with 2 consecutive slots of the hash table filled?

Slot i and $(i+1) \bmod \mathrm{m}$ are defined to be consecutive slots.

A. $1/2$
B. $1/3$
C. $1/4$
D. $2/3$

Your Answer: B | Correct Answer: B | Correct | Discuss

Q #11 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

An open-addressing hash table(with m slots) that resolves collisions using linear probing is initially empty. Key $k1$ is inserted into the table first, followed by $k2$, and then $k3$ (the keys themselves are drawn randomly from a universal set of keys).

What is the probability that searching for $k1$ takes exactly two probes?

A. $(m-2)/m)^3$
B. $3/m^2$
C. $2/m^2$
D. None of these

Your Answer: D | Correct Answer: D | Correct | Discuss

Q #12 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

Suppose you insert three keys into a hash table with m slots. Assuming the simple uniform hashing assumption, and given that collisions are resolved by chaining, what is the probability that both slots 0 and 1 are empty?

A. $((m-2)/m)^3$
B. $((m-3)/m)^3$
C. $(m/m-1)^3$
D. $((m-2)/(m-1))^3$

Your Answer: A | Correct Answer: A | Correct | Discuss

Q #13 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

Consider a hash table with m slots that uses chaining for collision resolution. The table is initially empty. What is the probability that after 4 keys are inserted that at least a chain of size 3 is created?

A. $\frac{4m-3}{m^3}$
B. m^{-4}
C. $m^{-3}(m-1)$
D. m^{-2}

Your Answer: A | Correct Answer: A | Correct | Discuss

Q #14 | Numerical Type | Award: 2 | Penalty: 0 | Algorithms

Suppose we implement linear probing with the hash function $h(x) = x \mod 9$. After inserting 7 keys, the table is shown as below:

0	1	2	3	4	5	6	7	8
9	18		12	3	14	4	21	

How many total insertion orders of keys are possible to reach the above state of the hash table?

For example, two possible insertion orders are -

- $12, 14, 3, 9, 4, 18, 21$ and
- $9, 12, 14, 3, 4, 21, 18$

Your Answer: 63 **Correct Answer: 63** Correct Discuss

Q #15 Multiple Choice Type Award: 2 Penalty: 0.67 Algorithms

Consider a hash table with n buckets, where external (overflow) Chaining is used to resolve collisions. The hash function is such that the probability that a key value is hashed to a particular bucket is $1/n$.

The hash table is initially empty and k distinct values are inserted in the table. What is the probability that the first collision occurs at the k^{th} insertions?

A. $\dfrac{(n-1)!}{(n-k)!\,n^{k-1}}$

B. $\dfrac{(n-1)!}{(n-(k-1))!\,n^{k}}$

C. $\dfrac{n!(k-1)}{(n-(k-1))!\,n^{k}}$

D. None of these

Your Answer: D **Correct Answer: C** Incorrect Discuss

You're doing good, you can target above 70 percentage!