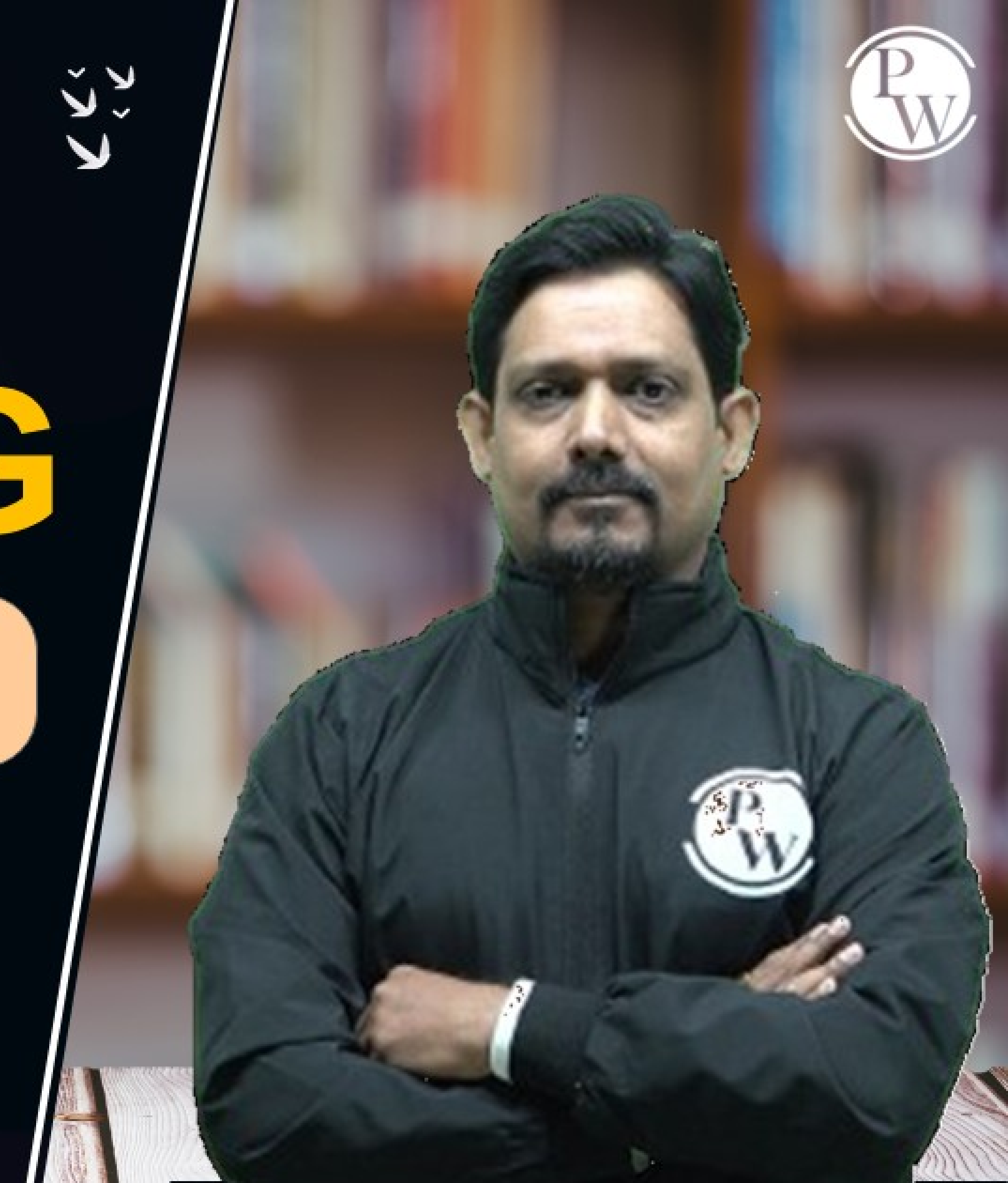
CS & IT ENGINEERING

Data Structure & Programming



Graph & Hashing

DPP.- 01

Discussion Notes

By- Abhishek Sir

[MSQ]

#Q. Insert the characters of the string K R P C S N Y T J M into a hash table of size 10. Use the hash function H(x) = (ord (x) – ord ('a') + 1) mod 10 and linear probing to resolve collisions. Which insertions cause collisions?

A. J ✓

B. C

C. M ✓

D. P

0	T
1	K
2	
3	C
4	N
5	Y
6	P
7	
8	R
9	S

(A, C)

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

$= 11 \% 10 = 1$

$h(J) = (10 - 1 + 1) \bmod 10 = 0$

Collision

$h(13) = (13 - 1 + 1) \bmod 10 = 3$

collision

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

W	X	Y	Z
23	24	25	26

[MCQ]

#Q. 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 $\frac{1}{n}$ The hash table is initially empty and K distinct values are inserted in the table. What's the probability that bucket number 1 is empty after the k^{th} insertion?

A. $\frac{(n-1)^{k}}{n^{k}}$

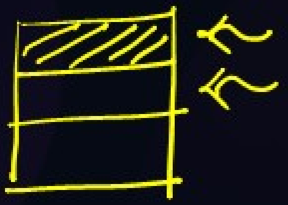
B. $\frac{(n-1)^{k-1}}{n^{k-1}}$

C. $\frac{(n-1)}{n}$

D. $\frac{1}{n^{k}}$

1/n uniform Hashing

$$\underbrace{\left(\frac{n-1}{n}\right) \times \left(\frac{n-1}{n}\right) \times \left(\frac{n-1}{n}\right) \cdots \times \left(\frac{n-1}{n}\right)}_{K\ \text{time}} = \left(\frac{n-1}{n}\right)^{K}$$



[A]

[MCQ]

#Q. Consider a hash table of size seven, with starting index zero, and a hash function (3x +4) mod 7. Assuming the hash table is initially empty, which of the following is the contents of the table when the sequence 8, 10, 15, 17 is inserted into the table using closed hashing? Note that □ denotes an empty location in the table.

A. 15, –, –, –, –, –, 17

B. 8, 15, 17, –, –, –, 10

C. 8, –, –, –, –, –, 10

D. 8, 17, 15, –, –, –, 10

Table Size is 7

$h(x) = (3x+4) \bmod 7$

8	0
15	1
~~15~~ 17	2
–	3
–	4
–	5
~~3?~~ 10	6

$h(8) = 28 \% 7 = 0$

$h(10) = 34 \% 7 = 6$

$h(15) = 49 \% 7 = 0$

$h(17) = \cancel{57}\ 55 \% 7 = 6$

[B]

[MCQ]

#Q. Consider a hash table with 50 slots. Collisions are resolved using chaining. Assuming simple uniform hashing, what is the probability that the first 3 slots are unfilled after the first 3 insertions?

50 Slots

first 3 free put in Rest of slot

$$\frac{47}{50} \times \frac{47}{50} \times \frac{47}{50} = \left(\frac{47}{50}\right)^3$$

A. $(47 \times 47 \times 47)/50^3$

B. $(49 \times 48 \times 47)/50^3$

C. $(47 \times 46 \times 45)/50^3$

D. $(47 \times 46 \times 45)/(3! \times 50^3)$

[MSQ]

#Q. Figure out true and false statements from below.

Closed Hashing

Secondary clus

A Clusters formed by quadratic probing [open addressing] is called primary cluster.

B The worst-case timing for successful and unsuccessful search in separate chaining is $\theta(1+\alpha)$(where α is average chain length) – True

C Primary clusters degrade the hash table performance. yes

D Some insertion may cycle through the list in quadratic probing yes

Expected Value $\frac{1}{n}\sum_{i=1}^{n}\left(\frac{i-1}{m}+1\right)$

[B, C, D]

[MCQ]

#Q. A hash table of length 10 uses open addressing with hash function h(k)=k mod 10, and linear probing. After inserting 8 values into an empty hash table, the table is as shown below.

How many different insertion sequences possible using the same hash function and linear probing will result in the hash table shown above?

A 7!(factorial)

B 8!(factorial)

C 8

D 1

Linear probing

$\boxed{8!}$ Any order you insert

0	10
1	21
2	32
3	43
4	54
5	65
6	76
7	~~74~~ 77
8	
9	

[NAT]

#Q. A hash table contains 9 buckets and uses linear probing to resolve collisions. The key values are integers and the hash function used is key % 9. If the values 41, 157, 72, 76, 31 are inserted in the table, in what location would the last key be inserted? ____7____.

72	0
	1
	2
	3
157	4
41	5
76	6
31	7
	8

$41 \% 9 = 5$

$157 \% 9 =$

$72 \% 9 = 0$

$76 \% 9 = 4$

$31 \% 9 = 7$

[MCQ]

#Q. Consider a hash table with 11 slots. The hash function is h(k) = k mod 11. The collisions are resolved by chaining. The following 11 keys are inserted in the order: 28, 19, 15, 20, 33, 30, 42, 63, 60, 32, 43. The maximum, minimum, and average chain lengths in the hash table, respectively, are.

A. 3, 0, 1

B. 3, 3, 3

C. 3, 0, 2

D. 4, 0, 1

[A]

THANK - YOU