

Sandesh Shrivastha

Assignment 8

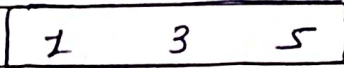
page 1

Date

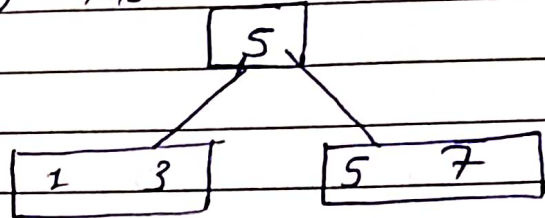
3) Show steps for inserting keys 1, 3, 5, 2, 9, 2, 4, 6, 8, 10 into B+ tree with $n=4$.

solⁿ

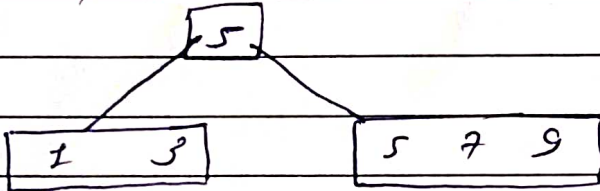
i) insert 1, 3, 5



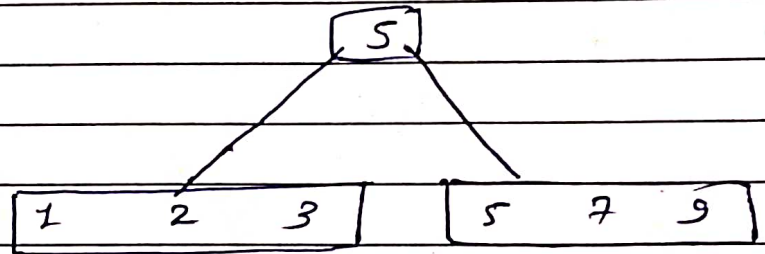
ii) insert 7



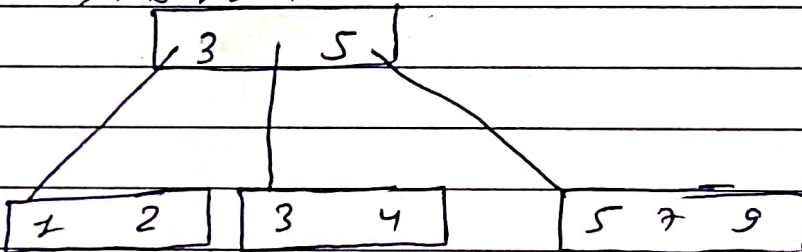
iii) Insert 9



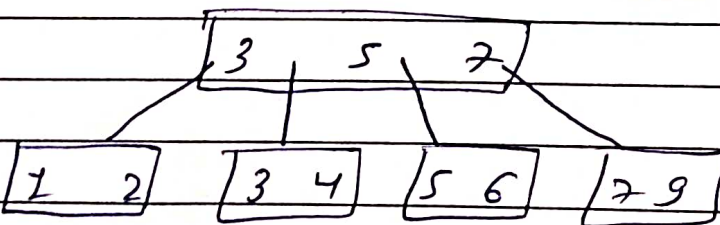
iv) insert 2



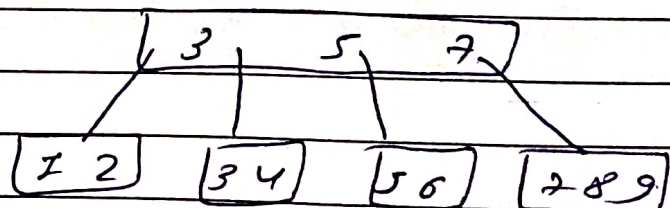
v) insert 4



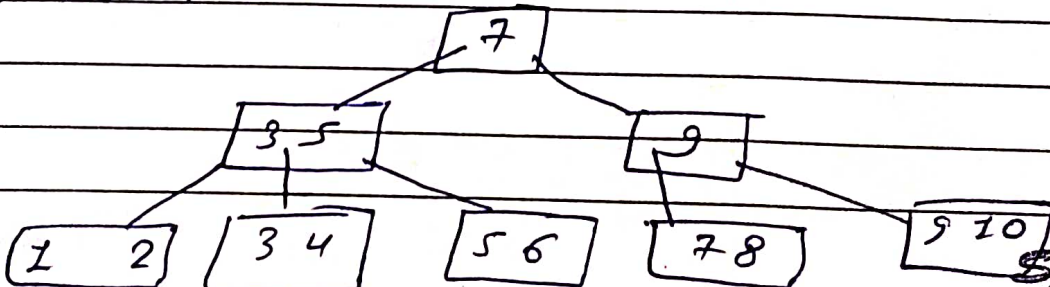
vi) insert 6



vii) insert 8



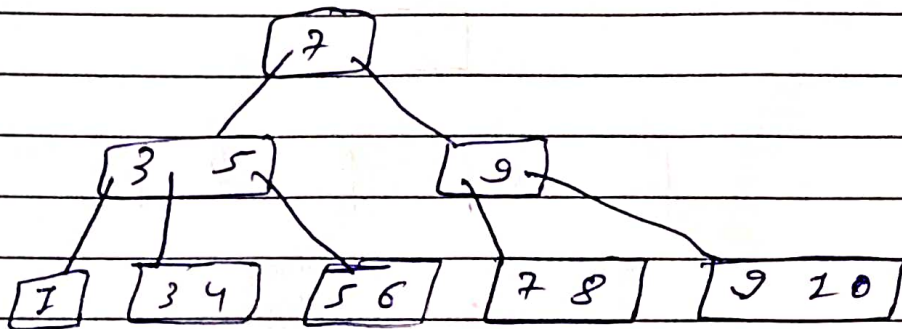
viii) insert 10



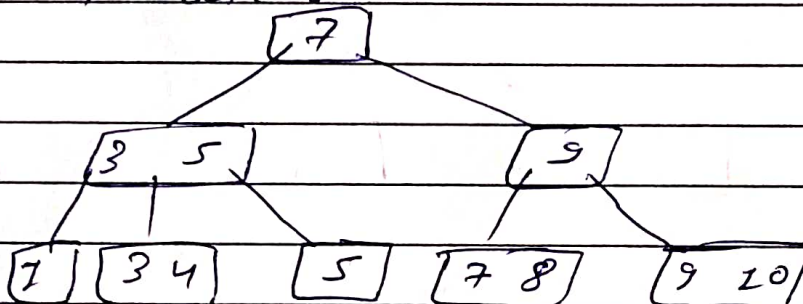
Spiral

Q 4/ delete 2, 6, 10.

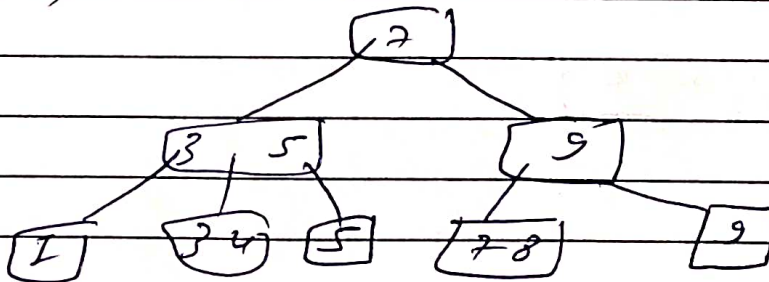
i) delete 2



ii) delete 6



iii) delete 10



Q 5/ The keys 12, 18, 13, 2, 3, 23, 5, 15 are inserted into initially empty hash table of length 10 using open addressing with $h(k) = k \bmod 10$ and linear probing. What is resultant hash table?

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$$h(k) = k \bmod 10$$

index	0	1	2	3	4	5	6	7	8	9
value	—	—	12	13	2	3	23	5	18	15
probe	—	—	0	0	2	2	3	2	0	4

$$12 \div 10 = 2,$$

$$18 \div 10 = 8$$

$$13 \div 10 = 3$$

$$2 \div 10 = 2 \times, 3 \times, 4 \checkmark$$

$$3 \div 10 = 3 \times, 4 \times, 5 \checkmark$$

$$23 \div 10 = 2 \times, 4 \times, 5 \times, 6 \checkmark$$

$$5 \div 10 = 5 \times, 6 \times, 7 \checkmark$$

$$15 \div 10 = 5 \times, 6 \times, 7 \times, 8 \times, 9 \checkmark$$

Q6) 501ⁿ,

$$h(k) = k \bmod 10 \rightarrow m$$

quadratic probing: $h'(k, i) = (h(k) + i^2) \bmod m$

$$9 \div 10 = 9$$

$$h'(9, 0) = (h(9) + 0^2) \div 10$$

$$= 9 \checkmark$$

$$h'(19, 0) = (h(19) + 0^2) \div 10$$

$$= 9 \times$$

$$h'(19, 1) = (h(19) + 1^2) \div 10$$

$$= 10 \div 10$$

$$= 0 \checkmark$$

$$h'(29, 0) = (h(29) + 0^2) \div 10$$

$$= 9 \times$$

$$h'(29, 1) = (h(29) + 1^2) \div 10$$

$$= 10 \times$$

$$h'(29, 2) = (h(29) + 2^2) \div 10$$

$$= 3 \checkmark$$

index	values	probes
0	19	1
1	—	—
2	—	—
3	29	2
4	59	5
5	49	4
6	69	7
7	—	—
8	39	3
9	9	0

Spiral

$$h'(39, 0) = x$$

$$h'(39, 2) = x$$

$$h'(39, 2) = x$$

$$h'(39, 3) = (9 + 9) \cdot 10 \\ = 18 \cdot 10 = 8$$

$$h'(49, 0) = x$$

$$h'(49, 4) = (9 + 16) \cdot 10 \\ = 5$$

$$h'(59, 5) = (9 + 25) \cdot 10 \\ = 4$$

$$h'(69, 6) = (9 + 36) \cdot 10 \\ = 5x$$

$$h'(69, 7) = (9 + 49) \cdot 10 \\ = 56 \cdot 10 \\ = 6$$

Q2) Soln,

double hashing

$$h(k, i) = (h_1(k) + i h_2(k)) \bmod m$$

$$h_1(k) = k \bmod 11$$

$$h_2(k) = k \bmod 7 + 1$$

index values probes

	0	—	—
14: $(h_1(14) + 0 \cdot h_2(14)) \bmod 11$	1	34	0
$= (3 + 0) \bmod 11 = 3$	2	—	—
$h(17, 0) = (h_1(17) + 0 \cdot h_2(17)) \cdot 11$	3	24	0
$= (6 + 0) \cdot 11$	4	37	0
$= 6$	5	16	0
$h(25, 0) = (3 + 0) \cdot 11$	6	17	0
$= 3x$	7	25	1
$h(25, 1) = (3 + 1 \cdot 4) \cdot 11$	8	—	—
$= (7) \cdot 11$	9	26	1
$= 7 \checkmark$	10	—	—

$$h(37, 0) = (4 + 0) \cdot 11 \\ = 4 \checkmark$$

$$h(34, 0) = (7 + 0) \cdot 11, h(16, 0) = (5 + 0) \cdot 11 \text{ Spiral} \\ = 1 \quad \sim 5$$

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$$h(26, 0) = (4 + 0) + 1 \times 1 \\ = 4 \times$$

$$h(26, 1) = (4 + 1 \times 5) + 1 \times 1 \\ = 9 + 1 \times 1 \\ = 9$$

Qn 2) soln,

$$\text{content of index} = \langle \text{key, block pointer} \rangle \\ = 6 + 10 = 16 \text{ bytes}$$

In first level, there will be entry for each record. So,
Total size of first level index = 16384×16 bytes

$$\begin{aligned} \text{no. of blocks in first level} &= \frac{\text{Total size}}{\text{block size}} \\ &= \frac{16384 \times 16}{1024} \\ &= 256 \checkmark \end{aligned}$$

In second level, there will be entry for each block in first level. So, Total entries = 256 and total size of second level index = no of entries \times size of 1 entry

$$= 256 \times 16$$

$$\therefore \text{no. of blocks in second level index} = \frac{256 \times 16}{1024} \\ = 4 \\ //$$