

Problem Set 6

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Part A

8.4.1

Action	No Index	Star Index	Moview Index	Both Indexes
Q_1	100	4	100	4
Q_2	100	100	4	4
I	2	4	4	6
Average	$2 + 98p_1 + 98p_2$	$4 + 96p_2$	$4 + 96p_1$	$6 - 2p_1 - 2p_2$

14.2.1

a)

i) We need $1000000/10 = 100000$ blocks for storing data. For these data, we need $1000000/(70 - 1) = 14493$ leaf nodes. Assume leaves are on the d-th layer. (d-1)th layer has $14493/70 = 208$ nodes. (d-2)th layer has $208/70 = 3$ nodes. (d-3)th layer should be the root. It has one node has 3 pointers. The total number of blocks are $100000 + 14493 + 208 + 3 + 1 = 114705$.

ii) The B-tree has 4 layers. There is another retrieval for data block. 5 times in total.

b)

Same results as (a). Make sure that pointers on the leaves point to the right block - even though data are not in order.

c)

i) We need $1000000/10 = 100000$ blocks for storing data. For these data, we need $100000/(70 - 1) = 1450$ leaf nodes. Assume leaves are on the d-th layer. (d-1)th layer has $1450/70 = 21$ nodes. (d-2)th layer should be the root. It has one node has 21 pointers. The total number of blocks are $100000 + 1450 + 21 + 1 = 101472$.

ii) The B-tree has 3 layers. There is another retrieval for data block. 4 times in total.

14.2.2

a)

i) The blocks are exactly the same.

ii) We start from the lower bound, visit along the leaves layer. It visits 3 interior nodes, $1000/69 = 15$ leaves, $1000/10 = 100$ data blocks. $3 + 15 + 100 = 118$ retrievals in sum.

b)

i) The blocks are exactly the same.

ii) We start from the lower bound, visit along the leaves layer. It visits 3 interior nodes, $1000/69 = 15$ leaves, 1000 data blocks (they are not guaranteed to be in the same block). $3 + 15 + 1000 = 1018$ retrievals in sum.

c)

i) The blocks are exactly the same.

ii) We start from the lower bound, visit along the leaves layer. It visits 2 interior nodes, $1000/10/69 = 2$ leaves, $1000/10 = 100$ data blocks. $2 + 2 + 100 = 104$ retrievals in sum.

Part B

