

2018-EE-67 M-Talha Masood

Q1 $\omega = 7200 \text{ rpm}$
 Surfaces = 16
 Tracks = 65536 per surface
 Sectors = 256 per track
 Bytes = 4096 per sector

Block = 16384 byte

★ Minimum Time

rotational delay = 0

seek time delay = 0

transfer time = $\frac{16384}{4096} = 4 \text{ sectors}$

In 4 sectors there are 3 gaps

sector angle = $\frac{4}{256} \times (90^\circ \text{ of } 360^\circ)$

$$= 5.06^\circ$$

$$\text{gap angle} = \frac{3}{256} \times (101 \text{ of } 360)$$

$$= 0.42$$

$$\text{Total angle} = 5.06 + 0.42$$

$$= 5.48$$

$$\omega = 7200 \text{ rpm} \times \frac{2\pi}{60}$$

$$\frac{2\pi}{T} = 7200 \times \frac{2\pi}{60}$$

$$T = \frac{60}{7200} = 8.33 \text{ ms}$$

$$\text{Transfer rate} = \frac{5.48^\circ}{360^\circ} \times 8.33$$

$$= 0.13 \text{ ms}$$

$$\text{Total ~~minimum~~ minimum time}$$

$$= 0.13 \text{ ms}$$

* Maximum Time

$$\text{seek time} = 1 + \frac{65536}{4000} = 17.384 \text{ ms}$$

$$\text{transfer time} = 0.13 \text{ ms}$$

$$\text{rotational delay time} = \frac{60}{7200} = 8.33 \text{ ms}$$

$$\text{Total maximum time} = 25.844 \text{ ms}$$

* Average Time

$$\text{Average seek time} = \frac{17.384}{2} = 8.692 \text{ ms}$$

$$\text{Average rotational delay time} = \frac{8.33 \text{ ms}}{2} = 4.165 \text{ ms}$$

$$\text{Transfer delay time} = 0.13 \text{ ms}$$

$$\text{Total Average Time} = 8.692 + 4.165 + 0.13 = 12.987 \text{ ms}$$

Q2

pointer = 4 byte long.

a) Smallest Possible record size

For smallest possible q, tent = 0 bytes, a, id = 4 bytes, answer = 4 bytes

Total size = record pointer + size of fields
= 4 + 4 + 4 = 12 bytes

b) Largest possible record when q, tent is NULL

Total 3 fields so 3 bit map so 1 byte added for it, a, id = 4 bytes, answer = 4 bytes

Total size = record pointer + size of fields + bit map

$$= 4 + 4 + 4 + 1 = 13 \text{ bytes}$$

Q-3

a) Max insertion without changing height of a tree

$$\text{Max entries} = 2d * (2d + 1)^{d-1}$$

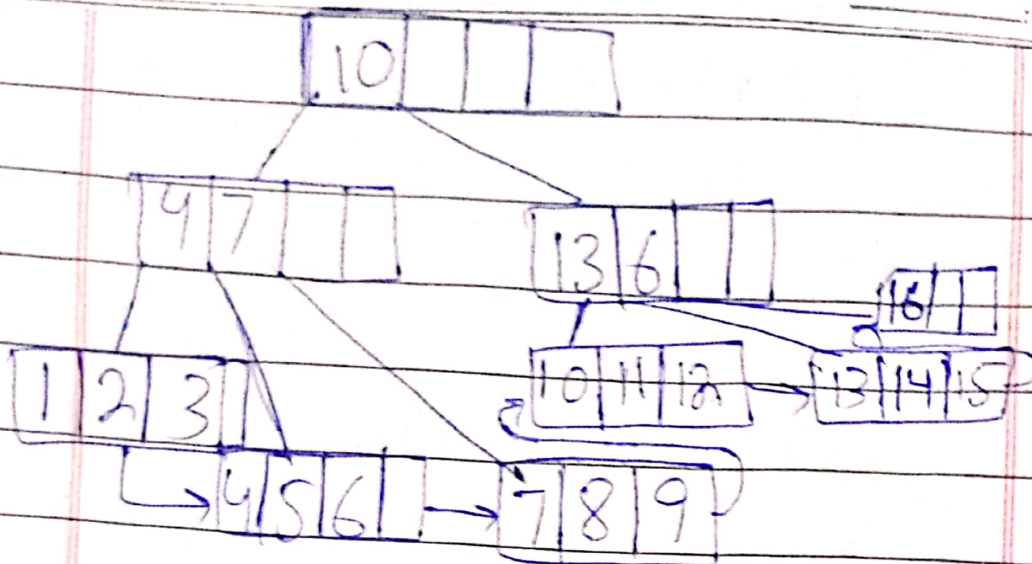
$$= 2 * (3)^2 = 18$$

$$18 - 6 = 12 \text{ insertions}$$

b) Min keys to change height

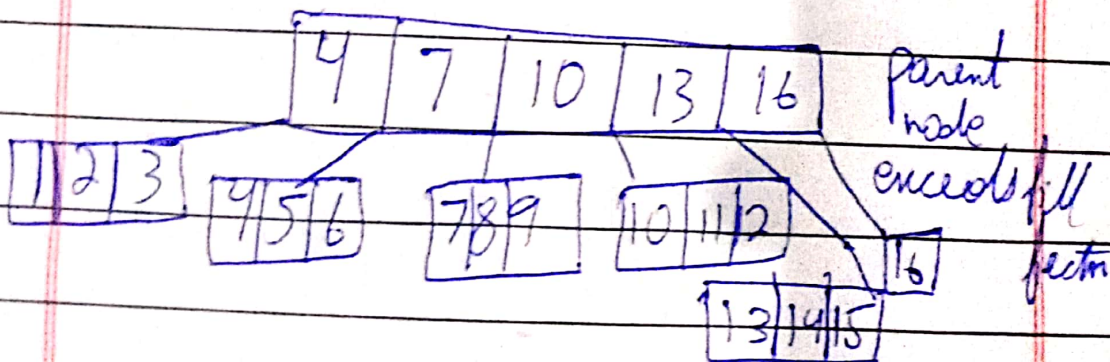
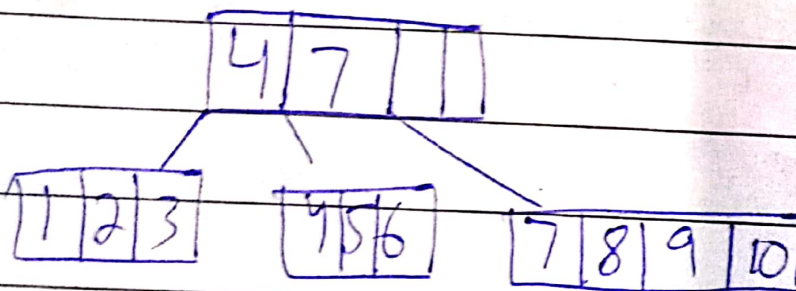
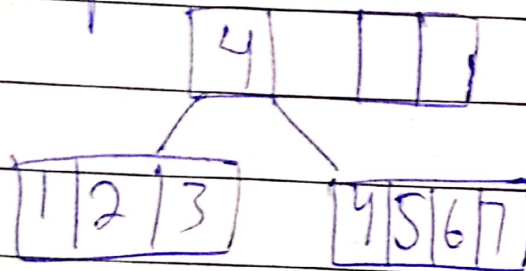
3 keys. eg less than 6 3 keys 1, 4, 5

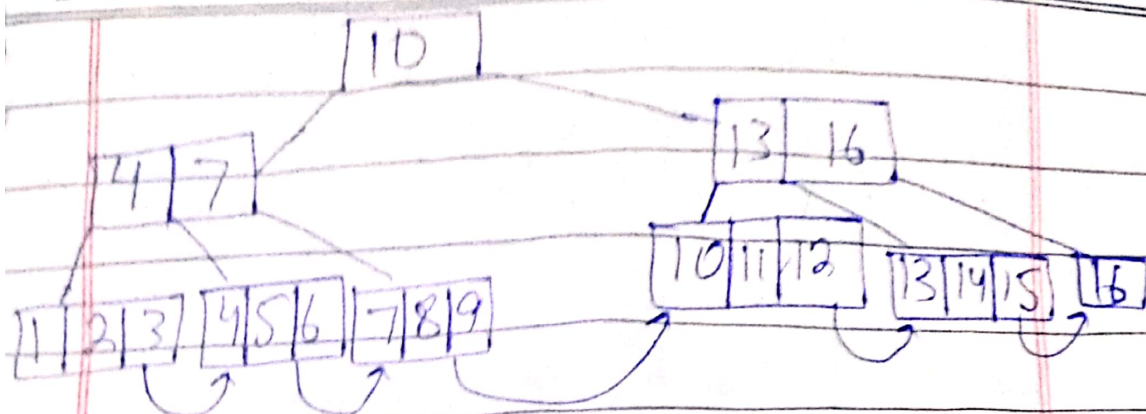
Q-5



Height of tree is 2

Steps





Q-4

a) To do a full table scan, we read each page into memory once

There are $12 \times \frac{1024}{64} = 192$ pages

so total 192 block accesses.

b) Read Page from memory: 3 page read
for index + 1 page read for leaf page
+ 1 page read for data page

Write page modifications into memory

and flush the pages back to disk:
1 page write for data page
The total cost of this is 6 disk I/O

c) In the worst case, any record can match the grade-received predicate. So we must check every record of table. This operation same as table scan and we will read every page so total 192 page reads. It should be noted that best & worst case will be same because there are no restrictions on how many times a grade-received value show up. We must always read every record to complete this query.