

BSCCS2001: Graded Solutions
Week 8

1. The time it takes, from when a read or write request is issued to when the data transfer begins, is known as the [MCQ :1 point]

☐ Response Time
☒ Access Time
☐ Seek Time
☐ Latency Time

Solution: Please refer to slide No. 39.17

2. Consider the disk with the following specifications: [MCQ: 3 points]

Average Seek Time = 12ms

Average Rotational delay = 3.5 ms

One disk block unit is 4 KB

Data Rate = 256 KB/sec

What will be the total disk access time for a single block unit ?

☐ 27.625
☒ 31.125 ms
☐ 15.5 ms
☐ 19.125 ms

Solution:

Given data: Average Seek Time = 12ms

Average Rotational delay = 3.5 ms

Disk block size = 4KB

Data Rate = 256KB/sec

To transfer the 4KB, the time required = Disc block size / data rate

= 4 KB / 256 KB sec = 0.015625 sec = 15.625 ms

The total disk access time = one seek + average rotational delay + block transfer time

= 12 + 3.5 + 15.625 = 31.125 ms

Thus, Option 2 is correct.

3. The Mean Time Between Failure (MTBF) of a single disk of the system is 600000 hours and on an average, the disk system will fail every 800 hours. What will be the number of disks in an array?

[MCQ:2 points]

- ☐ 800
- ☐ 125
- ☒ 750
- ☐ 1333

Solution:

Here, MTBF(one disk) = 600000 hours

MTBF(array) = 800 hours

MTBF(array) = MTBF(one disk)/ Number of disk in array

So, Number of disk in array = $600000/800 = 750$

Thus, Option 3 is correct.

4. Consider the following statements:

- In a heap file organization, it is necessary to reorganize the file from time to time, in order to restore the sequential order.
- In a sequential file organization, if there is no free space, then a newly inserted record will be kept in the overflow block.

What is the number of correct statements?

[NAT: 1 point]

Answer: 1

Solution: In heap file organization, manual reorganization is not required for maintaining order.

In sequential file organization, a newly inserted record according to the order of key is kept in overflow block if space is not available.

5. Which disk arm scheduling algorithm ensures minimum possible change in head direction on an average, while servicing a sequence of disk access requests?

[MCQ:2 points]

- ☐ FCFS
- ☒ SCAN
- ☐ SSTF
- ☐ LSTF

Solution:

In SCAN algorithm, the disk arm moves into a particular direction and services the requests coming in its path and after reaching the end of disk, it reverses its direction and again services the requests arriving in its path. So, this ensures minimum possible change in head direction. Hence, option 2 is correct.

Unlike SCAN, all the other three algorithms mentioned as options use a specific criterion for selecting the next read and thus depending upon some specific read sequence they will have a lot more head direction change. Irrespective of any read sequence, SCAN will always work with reversing its head only once.

6. Consider a disk with sector size of 512 bytes, 3000 tracks/surface, 50 sectors/track and 8 double-sided platters. Which of the following is a correct choice for the number of cylinders and block size? [MCQ:1 point]

- ✓ Number of cylinders= 3000, block size= 1536
- ☐ Number of cylinders= 6000, block size= 256
- ☐ Number of cylinders= 3000, block size= 256
- ☐ Number of cylinders= 6000, block size= 786

Solution:

The number of cylinders is equal to the number of tracks per surface always, which is = 3000.

A possible block size must always be a multiple of the sector size.

Since sector size is 512 bytes, one possible block size is $512 * 3 = 1536$ bytes.

All other given sizes in options are not a multiple of 512.

Hence, option 1 is correct.

7. Which of the following is **not** an objective of file organization in DBMS ?

[MCQ:1 point]

- ✓ Keeping the relations in normalized form so as to reduce redundancy.
- ☐ Efficient storage of records.
- ☐ Selection operations on records should work efficiently.
- ☐ Update operations on records should work efficiently.

Solution:

Please refer to slide No.

8. Which of the following statements is/are correct? [MSQ: 1 point]
- ☐ Rotational latency is the time it takes to reposition the arm over the correct track.
 - ✓ Access time consists of Seek Time and Rotational latency.
 - ✓ Data-transfer rate is the rate at which data can be retrieved from or stored to the disk.
 - ☐ None of the above

Solution:

- Rotational Latency is the time it takes for the sector to be accessed to appear under the head.
- Access time consists of Seek Time and Rotational latency.
- Data-transfer rate is the rate at which data can be retrieved from or stored to the disk.

9. Consider the Binary Search Tree (BST) shown in Figure 1.

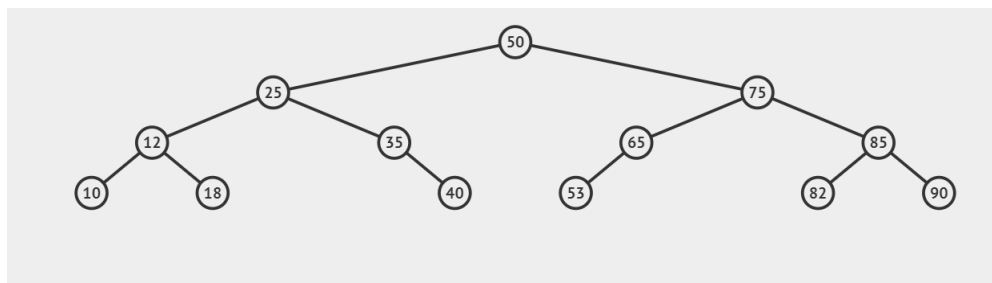
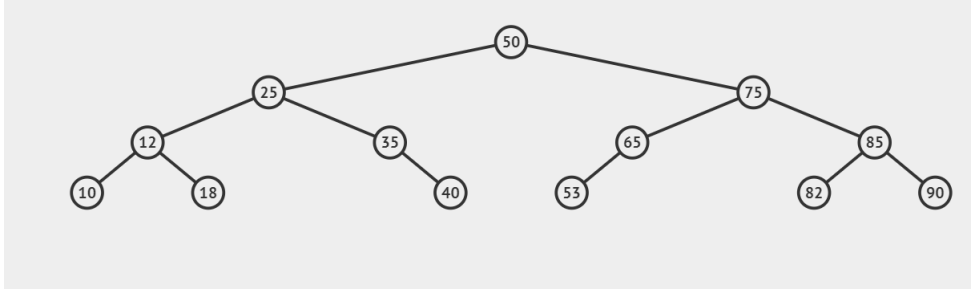


Figure 1: BST

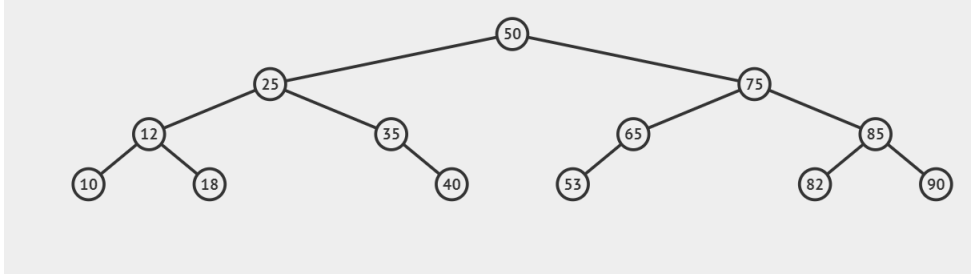
Which of the following sequences will result in the given tree? [MSQ:3 points]

- ✓ 50,25,75,65,35,12,85,10,82,40,53,90,18
- ✓ 50,25,75,65,12,35,85,10,18,40,53,90,82
- ☐ 50,65,75,25,12,35,85,10,18,40,53,90,82
- ☐ 50,25,65,75,12,35,85,10,18,53,40,82,90

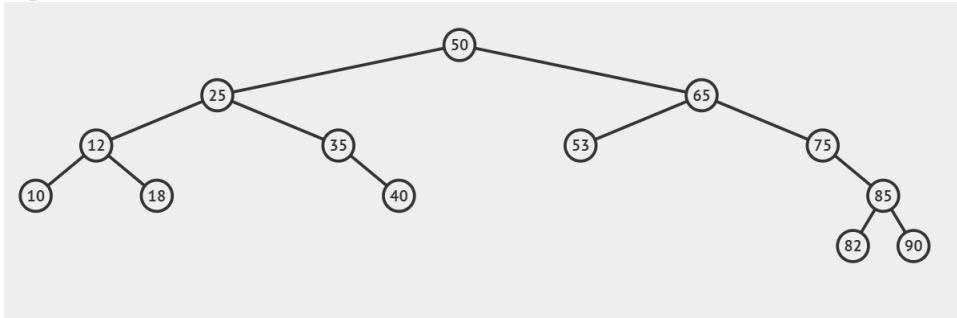
Solution: Option 1: 50,25,75,65,35,12,85,10,82,40,53,90,18 will result in :



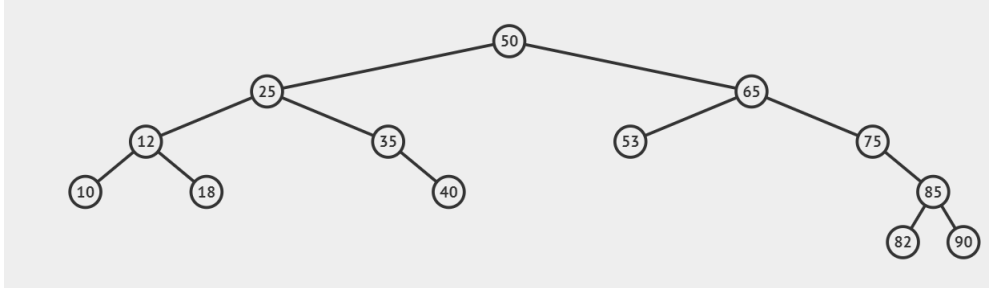
Option 2: 50,25,75,65,12,35,85,10,18,40,53,90,82 will result in :



Option 3: 50,65,75,25,12,35,85,10,18,40,53,90,82 will result in:



Option 4: 50,25,65,75,12,35,85,10,18,53,40,82,90 will result in:



Thus, options 1 and 2 are correct

10. Which of the following statements is/are true?

[MSQ:1 point]

- ☐ In case of binary search, the algorithm starts with the first element, compares with the given key value and returns yes if they match.
- ☐ In case of linear search, the algorithm start with comparing the key k with the middle element in the list and if the key matches, then it returns the index.
- ☐ In case of linear search, the input for the algorithm must be a sorted list.
- ✓ ☒ None of the above.

Solution:

- In case of linear search,
 - the algorithm starts with the first element, compares with the given key value and returns yes if they match.
 - If it does not match, then it proceeds sequentially comparing each element of the list with the given key until a match is found, or the full list is traversed.
- In case of binary search,
 - The input for the algorithm is a sorted list. The algorithm compares the key k with the middle element in the list.
 - If the key matches, then it returns the index.
 - If the key does not match and is greater than the middle element, then the new list is the list to the right of the middle element.
 - If the key does not match and is less than the middle element, then the new list is the list to the left of the middle element.

11. Which among the following factors does the Data Transfer Rate of a magnetic disk depend on? [MSQ:2 points]

- ☐ Number of bytes to be transferred
- ☒ Rotational speed of disk
- ☒ Density of track
- ☐ Seeking speed of read head

Solution:

Data transfer rate = amount of data present on one track / Time period of rotation.

option 1, is wrong since file size, i.e., the number of bytes to be transferred does not determine the transfer rate, but it determines the transfer time.

option 2, is correct because rotational speed determines the time period of rotation, which in turn decides transfer rate as given in the formula.

option 3, is correct since track density determines the amount of data present on the track which in turn determines the transfer rate as given in formula.

option 4, is wrong since seek speed has nothing to do with transfer rate of data.

12. What will be the asymptotic worst-case running time of the following code?

[MCQ:2points]

```
int sum = 0;
for(int i = 1 ; i <= n ; i++){
    for(int j = 1 ; j <= n ; j=j*3){
        sum = sum + i + j;
    }
}
```

- ☐ $O(n)$
- ☐ $O(n^2)$
- ☐ $O(\log_3 n)$
- ☒ $O(n \log_3 n)$

Solution: The outer loop runs n times and for each iteration of the outer loop the inner loop runs $\log_3 n$ times. Therefore, the total number of iterations are $n \log_3 n$.