

WEEKLY TEST – 07

Subject : Operating System

Topic : File System and Device Management



Maximum Marks 15

Q.1 to 5 Carry ONE Mark Each

[MCQ]

1. Suppose an index-based file system with the i-node comprises 32 indexes, 1 indirect index pointing to disk block containing an array of direct indexes, and 1 2-level index in the usual way. Assume that each index takes 2 bytes and the disk block is 512 bytes, then the number of disk accesses it takes to read the 8000th byte of the file (assuming no caching is done) is .
- (a) 1 (b) 2
(c) 3 (d) 4

[MCQ]

2. A Unix inode stores_____.
- (a) Only the name of a file.
(b) Only file allocation information about a file.
(c) Only access permission information about a file.
(d) Access permissions and file allocation information for a file, as well as some other information.

[NAT]

3. How many times does the following program prints the "GateWallah"?_____

```
#include <stdio.h>
#include <unistd.h>
int main ()
{
    int a;
    for (a = 0; a < 3; a++)
        fork ();
    printf ("GateWallah\n");
    return 0;
}
```

[MCQ]

4. What is the advantage of using multiple threads over multiple processes in an application?
- (a) Improved security
(b) Increased memory usage
(c) Improved performance and responsiveness
(d) Reduced need for synchronization.

[MCQ]

5. What is thread-local storage, and how it is used in multi-threaded program?
- (a) Thread-local storage is a mechanism for allocating thread libraries to threads in a process.
(b) Thread-local storage is a mechanism for allocating storage for thread-specific data.
(c) Thread-local storage is a mechanism for sharing data between threads in a process.
(d) Thread-local storage is a mechanism for synchronizing access to shared resources.

Q.6 to 10 Carry TWO Mark Each

[NAT]

6. Assume a magnetic disk containing 800 sectors per track, an application needs to read 200 randomly scattered sectors for loading the libraries at startup. Reading of each sectors requires exactly one disk access. The average seek time of the disk to a random location is given as 20 ms. Rotational speed of the disk is 12000 rpm, then the time taken to load libraries at startup to run the application is _____ms.

[NAT]

7. Disk requests come into the disk driver for cylinders, 20, 32, 30, 12, 50, 16 and 48, in that order. A seek takes 6 msec per cylinder. The total number of cylinders are 51. If the arm is initially at cylinder 30. The seek time that is needed for elevator algorithm (initially moving upward) is _____msec.

[MCQ]

8. A UNIX file system has 1KB block size and 4- byte disk address. What is the maximum file size, if the inode contains 8 direct block entries, one single indirect block entry, one double indirect block entry and one triple indirect block entry?
- (a) 10 GB (b) 16 GB
(c) 30 GB (d) 50 GB

[MSQ]

9. Which of the following statements is/are true?
- (a) The file allocation table uses much less disk space than the linked structure.
(b) The simple linked structure uses much less disk space than the file allocation table method.
(c) The file allocation table method allows faster seeks in files.
(d) The simple linked allocation method allows faster seeks in files.

[NAT]

10. Consider only FCB of file in memory, block pointer requires 16 bits and that blocks holds 2048 bytes each, then the number of disk accesses are needed to bring byte j of the file into memory when the file is stored using contiguous allocation is _____?

Answer Key

- | | |
|--------|---------------|
| 1. (b) | 6. (4501.25) |
| 2. (d) | 7. (540 msec) |
| 3. (8) | 8. (b) |
| 4. (c) | 9. (c) |
| 5. (b) | 10. (1) |



Hints and Solutions

1. (b)

The disk block that will have the 8000th byte of the file = $\frac{8000}{512} = 15.625$

Data blocks i.e . . . 15 data blocks are full and the 16th data block is holding the 8000th byte of the file, which means we have to read the i-node into the memory (no caching) for the direct block address which ranges from (0 – 31) and corresponding direct data block. Hence 2 reads are required, therefore option (b) is correct.

2. (d)

A Unix inode stores access permissions and file allocation information for a file, as well as some other information.

3. (8)

Main

|

$2^3 - 1$

Total $7 + 1 = 8$ because main will also print GateWallah.

4. (c)

As threads are light weight processes, it improves performance and responsiveness as compared to multiple process.

5. (b)

Thread local storage is a mechanism for storing data that is private to each thread. Thread Local Storage (TLS) is the mechanism by which each thread in a given multithreaded process allocates storage for thread-specific data. In standard multithreaded programs, data is shared among all threads of a given process, whereas thread local storage is the mechanism for allocating per-thread data.

6. (4501.25)

Given 12000 Rpm

12000 rotations in a minute \rightarrow 60 seconds

12000 rotations in an half minute = $\frac{60}{12000 * 2}$

= 2.5 ms (which is the average rotational delay)

Now, we have 800 sectors per track

12000 * 800 sectors in 60 seconds

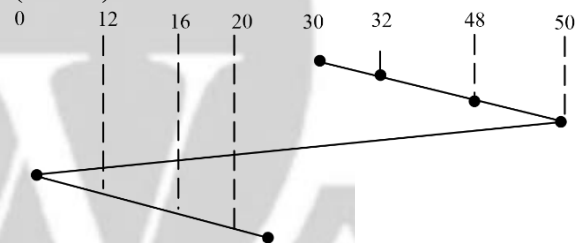
1 sector = $\frac{60}{12000 * 800} = 0.00625\text{ms}$

Total time to access a random sector = average seek time + average rotational delay + time to read from 1 sector

= $20 + 2.5 + 0.00625 = 22.50625\text{ms}$

We have to read 200 randomly located sector so total time = $200 * 22.50625 = 4501.25\text{ms}$

7. (540ms)



$(50 - 30) + (50 - 0) + (20 - 0)$
 $20 + 50 + 20 = 90$
 $90 * 6 \text{ msec}$
 540 msec.

8. (b)

Direct block entry points 1KB.

So, 8 direct block entries can point $1 \times 8 = 8 \text{ KB}$

Single indirect block:

We have 4 byte address

So, number of blocks in indirect block = $1 \text{ KB} / 4 = 256 \text{ blocks.}$

One indirect block entry can point $256 \times 1 \text{ KB} = 256 \text{ KB}$

Double indirect block:

Similarly, $256 \times 256 \times 1 \text{ KB} = 64 \text{ MB}$

Triple indirect block:

$$256 \times 256 \times 1\text{KB} = 16\text{ GB}$$

$$\text{Total file size} = 16\text{ GB} + 64\text{ MB} + 256\text{ KB} + 8\text{ KB} \\ \approx 16\text{GB}$$

9. (c)

The advantage of FAT over simple linked file structure is that, the FAT method allows faster seeks in files.

10. (1)

Since that allocation used is a contiguous method, all the blocks are stored contiguously. Therefore, a particular byte is accessed in 1 disk access.



For more questions, kindly visit the library section: Link for web: <https://smart.link/sdfez8ejd80if>



PW Mobile APP: <https://smart.link/7wwosivoicgd4>