## Branch : CSE & IT                    Batch : Hinglish

# Operating Systems

## File System & Device Management    | DPP 02 |

**[NAT]**

**1.** Consider a disk queue with request for I/O to block on cylinders 53, 98, 140, 59, 115, 185, 197, 86. The SCAN algorithm as used. The head is initially at 100 moving towards left. The cylinders are numbered from 0 to 199. The total head movement incurred while servicing these request is_____.

**[MCQ]**

**2.** Consider the following statements:

$S_1$: Loop instructions cannot be interrupted till they complete.

$S_2$: Nearest cylinder next disk scheduling strategy gives the best through put in comparison to first come first serve scheduling strategy.

$S_3$: Using large file block size in a fixed block size file system leads poor disk through put.

Which of the above statements are incorrect?

(a) Only $S_1$          (b) Only $S_1$, $S_2$ and $S_3$
(c) Only $S_1$ and $S_3$    (d) Only $S_2$

**[NAT]**

**3.** Consider a disk has 100 numbered from 0 to 99. At some time the disk arm is at cylinder 40 and there is a queue of disk access request for cylinder 16, 35, 25, 60, 80, 90 and 20. If Shortest seeks time first (SSTT) is being used for scheduling disk access, the request for cylinder 60 is serviced after servicing the number of request _____.

**[NAT]**

**4.** An unix style I-node has 10 direct pointers and two single 5 double and 2 triple Indirect pointers. Disk block size is of 8 KB, disk block address is 32 bits. The maximum possible file size is _____TB.

**[NAT]**

**5.** Consider a disk queue with request sequence 125, 85, 46, 74, 80, 112, 21, 53, 140, the initial position of head is at 50 and it is moving towards right. The cylinder are number 0 to 150. Calculate the total time required to

serve this request. When 4 ms time is needed to move head from one cylinder to another. The C-lock algorithm is used.

**[MSQ]**

**6.** Choose the correct statements from following
(a) A record is a collection of related fields that can be treated as a unit by some application program.
(b) A file is a collection of similar records.
(c) A database is a collection of non-related data.
(d) A field is the basic element of data

**[MCQ]**

**7.** Each Inode in a file system has 6 direct pointers to disk blocks, 4 single-indirect pointers to disk blocks, 3 double-indirect pointers to disk blocks and nothing else. A disk block is 500 bytes, and a pointer to disk block is of 10 bytes. The entire disk consists 17,000,000 bytes at most. Calculate the maximum size [in byte] of a file in this file system.
(a) 3850000          (b) 3853400
(c) 3853200          (d) 3853000

**[MCQ]**

**8.** In a UNIX OS, each data block is of 512 bits, each node has 5 direct data block addresses and three additional addresses. One for single indirect block, one is for double indirect block and one is for triple indirect block. Each block is addressed with 128-bit. Calculate the total size of a file possible in the file system (in k-bits).
(a) 81.91 to 81.92    (b) 82.91 to 82.92
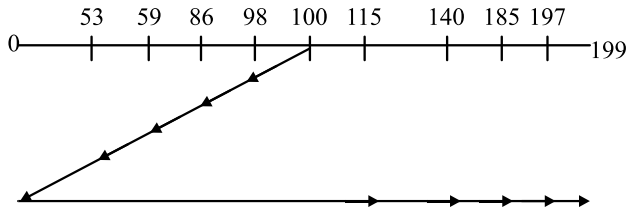(c) 80.91 to 80.92    (d) None of these

# Answer Key

1. **(299)**
2. **(c)**
3. **(4 to 4)**
4. **(128 to 128)**

5. **(936)**
6. **(a, b, d)**
7. **(d)**
8. **(d)**

# Hints & Solutions

**1.** **(299)**



Total head movement = (100 − 98) + (98 − 86) + (86 − 59) + (59 − 53) + (153 − 0) + (115 − 0) + (140 − 115) + (185 − 140) + (197 −185) + (199 − 197)

= 2 + 12 + 27 + 6 + 53 + 115 + 25 + 45 + 12 + 2

= 299

**2.** **(c)**

**$S_1$:** CPU checks for interrupt after completion of current instruction execution. So, If loop certain more than 1 instruction, it can interrupt in between.

Given statements is false.

**$S_2$:** Nearest cylinder next disk scheduling gives best through but may lead to starvation.

**$S_3$:** Vising large file block size in a fixed block size file system.
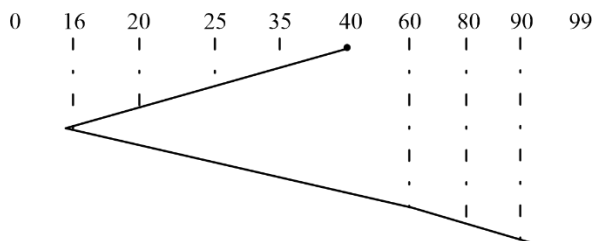
Leads to better disk through put poor disk space utilization.

• To store small data, we have to allocate complete block to it.

So, Gives statement is false.

**3.** **(4 to 4)**

• Shortest seeks time first (SSTF) is used for request 16, 35, 25, 60, 80, 90 and 20.

• Disk access request diagram.



∴ 60 is serviced after servicing 4 request.

**4.** **(128 to 128)**

Number to disk block address = $\dfrac{\text{Disk block size}}{\text{Disk block address size}}$

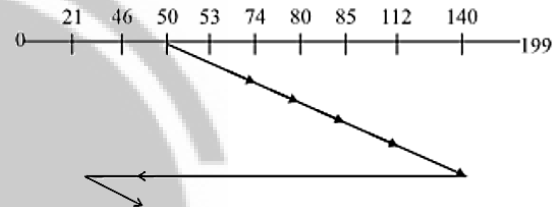$= \dfrac{8\text{KB}}{4\text{B}} = 2\,\text{K} = 2^{11}$

Now, tiple pointer will indicate maximum possible file size.

Hence, maximum possible file size,

$= 2 \times (2^{11}) \times (2^{11}) \times 2^{13}\,\text{Bytes}$

$= 2^7 \times 2^{40}\,\text{Bytes}$

$= 128\,\text{TB}$

**5.** **(936)**

Total head movement = (53 − 50) + (74 − 53) + (80 − 74) + (85 − 80) + (112 − 85) + (125 − 112) + (140 − 125) + (140 − 21) + (46 − 21)

= 3 + 21 + 6 + 5 + 27 + 13 + 15 + 119 + 25.

= 234



Time required for 1 head movement = 4 ms

Total time required = 234 × 4

= 936 ms

**6.** **(a, b, d)**

A data base is a collection of related data.

**7.** **(d)**

Each pointer is 10 bytes, so each disk block can contain

$\dfrac{500}{10} = 50$ pointers

An Inode can reference 5 blocks directly and each single indirect pointer references a block which have 50 pointers.

So, a total of 200 blocks can be referenced by 4 single indirect pointers.

similarly, each double-indirect pointer references a block of 50 pointers, so each of them again reference a block of 50 pointers, means 2500 blocks in total. So, for 3 double-indirect pointers, a total of 7500 blocks referenced by them.

Total: 6 + 200 + 7500 = 7706

which mean, 7706 × 500 = 3853000

**8.** **(d)**

Total file size =

$$\left[\text{Direct DBA} + \text{No. of single indirect pointers}\left(\frac{\text{Data Block size}}{\text{DBA}}\right)+ \right.$$

$$\text{No. of double indirect pointer}\left(\frac{\text{Data block size}}{\text{DBA}}\right)^2+$$

$$\left.\text{No. of triple indirect pointer}\left(\frac{\text{Data Block Size}}{\text{DBA}}\right)^3\times\right]$$

Data Block Size

Data block Size = 512 bits

$$\left(\frac{\text{Data Block Size}}{\text{DBA}}\right) = \text{No. of disk block address stored}$$

inside one block.

Maximum file size

$= [5 + 1(4) + 1(4)^2 + 1(4)^3] \times 512$

$= [5 + 4 + 16 + 64] \times 512$

$= 45.568$ K bits