11.2: Contrast the performance of the three techniques for allocating disk blocks (contiguous, linked, and indexed) for both sequential and random file access.

Contiguous:

Advantage:

* Both sequential and direct accesses are supported.
* It’s extremely fast as the number of seeks are minimal because of contiguous allocation of file blocks.

Disadvantage:

* External fragmentation.
* Need to know how much space is needed for a file.

Linked:

Advantage:

* Flexible with file size.
* No External fragmentation. Better memory utilization.

Disadvantage:

* Only support sequential access.
* Need space for pointers.
* Reliability, pointer might be lost or damaged.

Indexed:

Advantage:

* Support direct access, providing faster access to file blocks.
* No external fragmentation.

Disadvantage:

* The pointer of the index block is generally greater than the pointer overhead.

11.8: Consider a file system that uses inodes to represent files. Disk blocks are 8KB in size, and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, as well as single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system?

8K/4 = 2048 number of ptrs/block

12\*8KB + 2048\*8KB + 2048\*2048\*8KB + 2048\*2048\*2048\*8KB = 64 terabytes

12.3: Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4,999. The drive is currently serving a request at cylinder 2,150, and the previous request was at cylinder 1,805. The queue of pending requests, in FIFO order, is   
2,069, 1,212, 2,296, 2,800, 544, 1,618, 356, 1,523, 4,965, 3,681  
Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms?  
(a) FCFS

(2150-2069)+(2069-1212)+(2296-1212)+(2800-2296)+(2800-544)+(1618-544)+(1618-356)+(1523-356)+(4965-1523)+(4965-3681) = 13011  
(b) SSTF

2150->2069->2296->2800->3681->4965->1618->1523->1212->544->356 = 7586  
(c) SCAN

Up: 2150->2296->2800->3681->4965->4999->2069->1618->1523->1212->544->356 = 7492

Down: 2150->2096->1618->1523->1212->544->356->0->2296->2800->3681->4965 = 7115  
(d) C-SCAN

2150->2296->2800->3681->4965->4999->0->356->544->1212->1523->1618->2069 = 9917

12.10: Compare the throughput achieved by a RAID level 5 organization with that achieved by a RAID level 1 organization.  
(a) Read operations on single blocks.  
(b) Read operations on multiple contiguous blocks.

a) The amount of throughput depends on the number of disks in the RAID system. A RAID Level 5 comprising of a parity block for every set of four blocks spread

over five disks can support four to five operations simultaneously. A RAID Level 1

comprising of two disks can support two simultaneous operations. Of course, there is

greater flexibility in RAID Level 1 as to which copy of a block could be accessed and

that could provide performance benefits by taking into account position of disk head

b) RAID Level 5 organization achieves greater bandwidth for accesses to multiple

contiguous blocks since the adjacent blocks could be simultaneously accessed. Such

bandwidth improvements are not possible in RAID Level 1.

12.12: Assume that you have a mixed configuration comprising disks organized as RAID level 1 and RAID level 5 disks. Assume that the system has flexibility in deciding which disk organization to use for storing a particular file. Which files should be stored in the RAID level 1 disks and which in the RAID level 5 disks in order to optimize performance?

Frequently updated data need to be stored on RAID Level 1 disks while data which is more frequently read as opposed to being written should be stored in RAID Level 5 disks.