CS544, Homework 3

• Question 1

  o Exercise 13.3.1:

    Suppose we are scheduling I/O requests for a disk, and the requests arrives as follows:

    | Time of arrival | Request for track |
    |-----------------|-------------------|
    | 0 msec          | 8,000             |
    | 1 msec          | 48,000            |
    | 10 msec         | 4,000             |
    | 20 msec         | 40,000            |

    The disk head initially at track 32,000.

    The time it takes the disk head to move \( n \) tracks is \( 1 + 0.00025n \) msec.

    The (average) latency and transfer time is total 4.3 msec.

Questions:

  o At what time is each request serviced fully if we use the elevator algorithm (it is permissible to start moving in either direction at first).

    Indicate the order in which the requests will be satisfied !!!

    Answer must be in this form (with derivations !)

    | Request (for track#) | Time of completion |
    |-----------------------|--------------------|
    | #1 track #            |                    |
    | #2 track #            |                    |
    | #3 track #            |                    |
    | #4 track #            |                    |

    Explanation:
At what time is each request serviced fully if we use the first come, first serve service discipline

Indicate the order in which the requests will be satisfied !!!

Answer must be in this form (with derivations !)

<table>
<thead>
<tr>
<th>Request (for track#)</th>
<th>Time of completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 track #</td>
<td></td>
</tr>
<tr>
<td>#2 track #</td>
<td></td>
</tr>
<tr>
<td>#3 track #</td>
<td></td>
</tr>
<tr>
<td>#4 track #</td>
<td></td>
</tr>
</tbody>
</table>

Explanation:
Question 2 (Exercise 13.4.6-8)

- Suppose we are using a RAID level 4 scheme (using even parity) with four data disks and one redundant disk.

Assume that blocks are a single byte.

Questions:

- Give the block of the redundant disk if the corresponding blocks of the data disks are:

  1. 01010110, 11000000, 00111011, and 11111011.

    **Answer:**

    11110000, 11111000, 00111111, and 00000001.

  2. 11110000, 11110000, 00111111, and 00000001.

    **Answer:**
Suppose that data disk 1 has failed.

Recover the block of that disk under the following circumstances:

- The contents of disks 2 through 4 are 01010110, 11000000, and 00111011, while the redundant disk holds 11111011.

  Answer:

- The contents of disks 2 through 4 are 11110000, 11111000, and 00111111, while the redundant disk holds 00000001.

  Answer:
Suppose the block on the first disk in part (1) is changed to 10101010.

What changes to the corresponding blocks on the other disks must be made?

1. Originally: 01010110, 11000000, 00111011, and 11111011.
   Changed to: 10101010, 11000000, 00111011, and 11111011.
   Answer:

2. Originally: 11110000, 11111000, 00111111, and 00000001.
   Changed to: 10101010, 11111000, 00111111, and 00000001.
   Answer:
Question 3 (Exercise 13.7.1-3)

- A patient record consists of the following:

  - 3 fixed-length fields: the patient's date of birth, social-security number, and patient ID, each field is 10 bytes long.
  - It also has the following 3 variable-length fields: (1) name, (2) address, and (3) patient history.
  - If pointers within a record require 4 bytes, and the record length is a 4-byte integer, how many bytes, exclusive of the space needed for the variable length fields, are needed for the record?

  You may assume that no alignment of fields is required.

  Answer:

  - A repeating field that represents cholesterol tests --- Each cholesterol test requires 16 bytes

  Show the layout of patient records if the repeating tests are kept with the record itself.

  Answer:

  (Draw a picture that shows the position of the records and where each pointer is pointing to).