**Bronson Edralin**

**EE 468 Operating Systems**

**Homework 8 8 pts**

**11/14/14**

**Problem 1** (1 pt). The following are two codewords for a horizontal-vertical even parity check code. Assume each has at most 1 hard bit error. Which of the two codewords are correct. Correct any incorrect codewords.

Codeword 1

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 |

Codeword 2

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 |

Codeword 1 is correct

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | **0** |
| 1 | 0 | 1 | 0 | **0** |
| 0 | 1 | 0 | 1 | **0** |
| 1 | 1 | 0 | 0 | **0** |
| **0** | **0** | **0** | **0** |  |

Codeword 2 is wrong

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 0 | 1 | 1 | 0 | **0** |
| 1 | 0 | 0 | 1 | **0** |
| 1 | 0 | 1 | 1 | **1** |
| 0 | 0 | 0 | 0 | **0** |
| **0** | **1** | **0** | **0** |  |

Codeword 2 (This is the corrected one)

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | **1** | 1 | 1 |
| 0 | 0 | 0 | 0 |

**Problem 2** (1 pt). Consider horizontal-vertical even parity check codes which can have soft errors (erasures) only. The codewords have *n* rows and columns. The following algorithm can correct for any one or two errors. Can it correct three errors? If it can then explain why. If it cannot then modify the algorithm so it does.

**for** *k* = 1, 2, ..., *n* **do**

**if** row *k* has a single soft error **then** correct it using even parity

**for** *k* = 1, 2, ..., *n* **do**

**if** column *k* has a single soft error **then** correct it using even parity

This algorithm can not correct three errors, because it is only checking the rows or columns one at a time with no regard to the other one.

Corrected algorithm:

**for** *j* = 1, 2, ..., *n* **do**

**if** row *j* has a single soft error **then** correct it using even parity

**for** *k* = 1, 2, ..., *n* **do**

**if** column *k* has a single soft error **then** correct it using even parity

**Problem 3** (1 pt) Consider a disk system with 8 disk drives, an ethernet switch, and two processors. If any one of the components fails then the disk system is considered to have failed (and a repairperson must fix it). Suppose the mean time to failure (MTTF) of an individual disk drive is 30,000 hours, the MTTF of a processor is 50,000 hours, and the MTTF of an ethernet switch is 20,000 hours. What is the MTTF of the disk system?

**The following are textbook problems**

**Textbook Problem 10.11 (a, b, c, d, e, f) (3 pts)**

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, 3681

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?

1. FCFS
2. SSTF
3. SCAN
4. LOOK
5. C-SCAN
6. C-LOOK
7. FCFS (First-come First Served) -> 13011
8. SSTF (Shortest Seek time First) -> 7586
9. SCAN “Elevator algorithm” ->7492
10. LOOK -> 7424
11. C-SCAN “Circular Elevator algorithm” -> 11630
12. C-LOOK “Circular Look” -> 7612

**Textbook Problem 10.12** (a, b) (1 pt)

Elementary physics states that when an object is subjected to a constant acceleration a, the relationship between distance d and time t is given by . Suppose that, during a seek, the disk in Exercise 10.11 2 accelerates the disk arm at a constant rate for the first half of the seek, then decelerates the disk arm at the same rate for the second half of the seek. Assume that the disk can perform a seek to an adjacent cylinder in 1 millisecond and a full-stroke seek over all 5,000 cylinders in 18 milliseconds.

1. The distance of a seek is the number of cylinders over which the head moves. Explain why the seek time is proportional to the square root of the seek distance.
2. Write an equation for the seek time as a function of the seek distance. This equation should be of the form , where t is the time in milliseconds and L is the seek distance in cylinders.
3. Calculate the total seek time for each of the schedules in Exercise 10.11. Determine which schedule is the fastest (has the smallest total seek time).
4. The percentage speedup is the time saved divided by the original time. What is the percentage speedup of the fastest schedule over FCFS?
5. 🡪
6. Using default equation:

Equation 1 (t=1, L=1):

Equation 2 (t=18, L=4999):

Solving for 2 Eqns: x=0.75, 0.24

Plug in:

Answer**:**

**Textbook Problem 11.9** (1 pt)

Consider a file system in which a file can be deleted and its disk space reclaimed while links to that file still exist. What problems may occur if a new file is created in the same storage area or with the same absolute path name? How can these problems be avoided?

Pretend there are two Users called User1 and User2. Both users want to create a new file with same absolute path. Lets call this new file SameFile. If User1 wants to open his version of SameFile using Logical Input-Output Central System (LIOCS) interface, LIOCS will simply open the first SameFile that it can find in the Volume Table of Contents (VTOC) of a disk, which basically has file labels for all files existing in a disk volume. There may be only one way to avoid this problem by making sure unique names for the files, but File System (FS) allows users to name their files whatever they want. What must happen is that should maintain a list of all links to a file and link must be removed when file is deleted. Can retain the links and only remove them when an attempt is made to access a deleted file. A file reference list must be maintained and the file may be deleted only when files and all links were deleted.