Homework #8 **M1522.000800 System Programming**

Sample Solution

Question 1

Memory Management & Garbage Collection

You are given two groups of statements relating to memory management and garbage collection below. In each group, only one statement is true. Your task is to indicate the statement that is true.

1.

(a) Using the first-fit algorithm on a free list that is ordered according to decreasing block sizes results in low performance for allocations, but avoids external fragmentation.

(b) For the best-fit method, the list of free blocks should be ordered according to increasing memory addresses.

(c) The best-fit method chooses the largest free block into which the requested segment fits.

(d) Using the first-fit algorithm on a free list that is ordered according to increasing block sizes is equivalent to using the best-fit algorithm.

2. Mark-and-sweep garbage collection are called conservative if

(a) they coalesce freed memory only when a memory request cannot be satisfied.

(b) they treat everything that looks like a pointer as a pointer.

(c) they perform garbage collection only when they run out of memory.

(d) they do not free memory blocks forming a cyclic list.

Question 2
Unix I/O vs.Standard I/O

a) in the following table, list the function calls that perform the task listed in the column ‘Function’ for both Unix I/O and Standard I/O.

Function	Unix I/O	Standard I/O
Open file	open	fopen
Close file	close	fclose
Read from file	read	fread
Write to file	write	fwrite
Seek in file	lseek	fseek

b) what is the main difference between Unix I/O and standard I/O?

=> Unix I/O is unbuffered, whereas standard I/O uses buffered I/O.

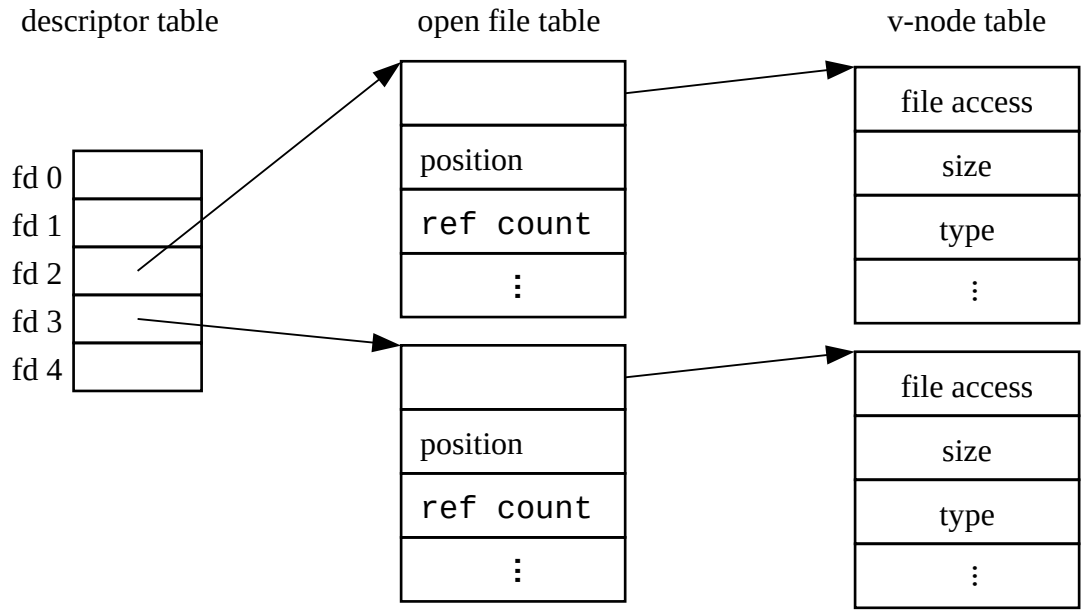
c) what are the header files that contain (most of) the declarations of Unix I/O and standard I/O? Hint: use the `man` command.

	Unix I/O	Standard I/O
Header file(s)	unistd.h sys/types.h sys/stat.h fcntl.h	stdio.h

Question 3

Representation of open files in a Linux system.

a) Draw the three main data structures for open files in the kernel and show how they relate.



b) for each of the three data structures, indicate whether the data structure is private to a process or global (shared by all running processes).

Data Structure	Per Process / Global
descriptor table	per process
open file table	global
v-node table	global

c) every process created by a Unix shell has initially three open files. What are those files and what file descriptor are they mapped to?

File Descriptor	Name
0	standard input
1	standard output
2	standard error