UFAZ – Bachelor of Computer Science
System Programming
Homework assignments

Exercise 1

The ***tee*** command reads its standard input until end-of-file and writes a copy of the input to standard output and file named in its command-line argu ment. See below example:

```
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$ vmstat
procs -----------memory---------- ---swap-- -----io---- -system-- ------cpu-----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa st
 0  0 1130196 431568 142596 2515632    2   10    51   118  167  105 33 13 54  0  0
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$ vmstat | tee vmstat.te
e
procs -----------memory---------- ---swap-- -----io---- -system-- ------cpu-----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa st
 2  1 1130196 431132 142608 2516584    2   10    51   118  167  105 33 13 54  0  0
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$ cat vmstat.tee
procs -----------memory---------- ---swap-- -----io---- -system-- ------cpu-----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa st
 2  1 1130196 431132 142608 2516584    2   10    51   118  167  105 33 13 54  0  0
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$
```

By default, tee overwrites any existing file with the given name. But if you add -a option (tee -a filename), it causes tee to append the text to the end of a file if it already exists.
Implement tee using I/O system calls only. Your program is supposed to read from file which is given as command-line argument. Specify appropriate flags to append to the file.

```
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$ gcc tee.c
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$ ./a.out vmstat.vm
procs -----------memory---------- ---swap-- -----io---- -system-- ------cpu-----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa st
 4  0 1130196 441052 142508 2516312    2   10    51   119  167  105 33 13 54  0  0
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$ cat output_tee.c
procs -----------memory---------- ---swap-- -----io---- -system-- ------cpu-----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa st
 4  0 1130196 441052 142508 2516312    2   10    51   119  167  105 33 13 54  0  0
konul@konul-ideapad-330S-14IKB:~/Documents/ufaz2021/system_programming2021/homework$
```

In the example above, **vmstat.vm** is the name of the file which is given as command-line argument. **a.out** is the name of the executable. **output_tee.c** is the file where tee command has appended to.

Exercise 2

sort command in Linux writes sorted concatenation of all FILE(s) to standard output. **ls** command lists directory contents.
Write a program which does the same job as this pipe: ls -l | sort. You may use **exec** family of functions in your source code.

Exercise 3

The fields **st_dev** and **st_ino** of the stat structure identify a file in the system in a unique way. Write a function **my_ttyname** similar to the library function **ttyname** which takes as argument a file descriptor and return a pointer to a (static) string contains the whole name of the matching file (searched in */ dev/pts*) or NULL if the file is not found. Use data types DIR, struct dirent, as well as functions opendir() and readdir().