Operating Systems–1: Autumn 2022
Programming Assignment 1: Finding Perfect Number
Submission Deadline: 3rd December 2022, 9:00 pm

Goal:- The objective of this assignment is to develop a multi-processed solution to find a list of perfect numbers.

Details:- *N is a perfect number if the sum of all its factors, excluding itself, is N ; examples are 6 and 28.*

As a part of this assignment, you need to implement a C program to find perfect numbers till **N** and list them into a single file.

The main program will read the numbers **N** and **K** from an input file. The main process will create a set of K processes. And then set up shared memory buffers with each of the child processes. The child processes will in turn, will also create shared memory buffers to communicate with the main process.

The numbers from 1 to N will be partitioned among these processes so that two processes do not work on the name number. Thus each process P_i will be responsible for a set of numbers. For each number in its set, the process P_i will determine if the number is a perfect number or not. If it is, P_i will store it in a local array. After completion, P_i will share the set of numbers it identified with the main process.

The main process will wait till all the processes are complete. It will then consolidate all the perfect numbers identified and communicated by child processes in a single output file.

Input File:- As mentioned above, the input will consist of two parameters **N** and **K**.

Output File:- For ease of understanding, each process P_i will also create a log file, $OutFile_i$ onto which it will store all the details of its execution. It will log each number it tests and the output it generates. Suppose Pi tests the number 1 to 10, then a sample output can be as follows:
1: Not a perfect number
2: Not a perfect number
.
.
.
6: Is a perfect number

.
.
.

On similar lines, the main process will create a log file OutMain which will consist of all the perfect numbers less than N and the process that identified it. A possible output format for two processes is as follows:

P1: num1 num2 ….
P2: num5 num6 ….

Report Details:- As a part of this assignment you have to prepare a report which will describe the low-level design of your program and give an analysis of its output.

Submission Format:- You have to upload: (1) The source code in the following format: Assgn1Src-<RollNo>.c (2) Readme: Assgn1Readme-<RollNo>.txt, which contains the instructions for executing the program. (3) Report: Assgn1Report-<RollNo>.pdf. Name the zipped document as: Assgn1-<RollNo>.zip

Please follow this naming convention. Otherwise, your assignment will not be graded.

Grading Policy:- The policy for grading this assignment will be -
(1) Design as described in report and analysis of the results: 50%; (2) Execution of the tasks based on description in readme: 40% (3) Code documentation and indentation: 10%.