

National University of Computer and Emerging Sciences, Lahore Campus



Course:	Operating Systems	Course Code:	CS 2006
Program:	BS(DS/SE)	Semester:	Fall 2023
Section:	BDS-5C & BSE-5A	Total Marks:	
Assignment:	2	Pages	(2)
Due Date:	15 October, 2023		

Important Instructions:

1. Submit each question file named as your roll number along with the question number., i.e., 21L-1111_Q1.c. DO NOT SUBMIT A ZIP FOLDER.
2. You are not allowed to copy solutions from other students. We will check your code for plagiarism using plagiarism checkers. If any sort of cheating is found, heavy penalties will be given to all students involved.
3. Late submission of your solution is not allowed.

Question 1 (Ordinary Pipes):

Implement a program to find if a given number is a perfect number. N is a perfect number if the sum of all of its factors, excluding itself, is N; examples are 6 and 28. The input is an integer, N. The output is true if the number is a perfect number and false otherwise. The main program will read the number N from the command line. The main process will fork two child processes. The numbers from 1 till $N/4$ will be assigned to the first child, and numbers from $N/4$ till $N/2$ will be assigned to the other child process. The task of each child is to find the sum of those numbers which are factors of N in the assigned number range. Using pipes, the child processes will communicate the sum of this result to the main process, which will determine if the number is perfect, and then report accordingly.

Question 2 (Named Pipes):

Create 2 independent programs that perform communication using named pipes.

One program will be the server program that will wait for the client to send some data via a named pipe. The data sent by the client is as follows:

Operator operand1 operand2

The operands can be +, -, *, /. The server will then apply the operator on the operands and return the result to the client via a named pipe. The client will then print the result on the screen. For example, if the client passed the following to the server: + 4 10, then the server will calculate 4+10 and return 14 to client via the pipe. The client will then print it.

(You can use sleep function for synchronization of both processes)

Question 3 (Threads):

Implement a program to count the frequency of unique words in a text file. The text file is partitioned into N segments (Taken through command line). Each segment is processed by a separate thread that outputs the intermediate frequency count for its segment. The main process waits until all the threads complete; then it computes the consolidated word-frequency data based on the individual threads' output.

(File reading should be done through a read system call only otherwise there will be no credit. You can assume that the partitioning of file is done by the number of words)

Question 4 (Threads):

Write a multithreaded program that calculates various statistical values for a list of numbers. This program will be passed a series of numbers on the command line and will then create three separate worker threads. One thread will determine the average of the numbers, the second will determine the maximum value, and the third will determine the minimum value. The array of numbers must be passed as parameter to threads, and the thread must return the calculated value to the main thread. The main thread will then print these values