2023-Batch-I-Set-2

Lab 1 - ICS 311 – Parallel and Distributed Computing

Questions

1. Write a C program that creates a child process using fork(). Both the parent and child processes should print their respective process IDs and compute the sum of first N natural numbers.

   Test Cases: N=5, N=10, N=3000, N=10000

Test Case	Execution time (sec)*
1	
2	
3	

   * Measure the total time taken for the computation using the clock() function available in the time.h library.

2. Write a C program that creates a child process using fork(). Divide a user-input array of integers into two halves as *odd* and *even* numbers. The parent process should compute the sum of the first half, and the child process should compute the sum of the second half. The child should send its partial sum to the parent using a pipe. The parent should then compute and display the total sum.

   Test Case 1 – Basic Even-sized Array
   Test Case 2 – Odd-sized Array with Mixed Numbers
   Test Case 3 – All Large Positive Numbers

Test Case	Execution time (sec)*
1	
2	
3	

3. Write a C program to multiply two matrices using POSIX threads (pthreads). Assign each thread the task of computing one row of the result matrix. Input the matrices from the user and print the result.

   Test Case 1 – Basic 2×2 Matrices (Small Positive Numbers)
   Test Case 2 – Rectangular Matrix Multiplication (4x2 × 2x4)
   Test Case 3 – Matrix with Negative and Zero Elements
   Test Case 4 – Identity Matrix Multiplication (3x3)
   Test Case 5 – Large Numbers

Test Case	Execution time (sec)*
1	
2	
3	

4. Write a C program to implement **Merge Sort** on an array of integers. The program should:

a) Accept the number of elements and the array from the user.
b) Sort the array using **Merge Sort** (recursive divide and conquer approach).
c) Print the sorted array.

Test Case	Execution time (sec)*
1 (n=10)	
2 (n=100)	
3 (n=1000)	

* Measure the total time taken for the computation using the clock() function available in the time.h library.

+ Use rand() function to get more numbers
