Computer Science Division
Department of Mathematics
Faculty of Science

Level 4- Semester 1
Course: COMP 403
Date: 2025

Q1- Using the multi-threading library omp.h, write a C++ program that computes $\pi(x)$ for $x = 10^n$, s.t. $0 \leq n \leq 7$ where $\pi(x)$ is the number of primes less than or equal to x. Then, displays each value of x with the count of nonprime numbers and the taken parallel execution time.

Q2- Compute the result of multiplying two given square matrices A and B.

Q3- Ask the user to enter matrix size and fill the matrix in parallel by using the following series:

$$\frac{1!}{n+1} - \frac{2!}{n+2} + \frac{3!}{n+3} - \frac{4!}{n+4} + \cdots + \frac{m!}{n+m}$$

where n is the current row number while m is the current column number.

Q4- Compute the result of multiplying Matrix A with Vector B using pthread.

Q5- Compute the result of the following algorithm using omp.

Algorithm (Prefix-Sums)

Input: An array X of $n = 2^k$ elements $(x_1, x_2, \ldots, x_n)$,
where k is a nonnegative integer.

Output: The prefix sums s_i , for $1 \leq i \leq n$

begin

1. if $n = 1$ then { set $s_1 := x_1$; return S }

2. for $1 \leq i \leq n/2$ ***pardo***
set $y_i := x_{2i-1} + x_{2i}$

3. set $Z :=$ Prefix-Sums(Y , n/2)

4. for $1 \leq i \leq n$ ***pardo***
{
i even : *set* $s_i := z_{i/2}$
$i = 1$: *set* $s_1 := x_1$
i odd > 1 : *set* $s_i := z_{(i-1)/2} + x_i$
}

5. return S

end