**Class:** Third Year (Computer Science and Engineering)

**Year:** 2025-26 **Semester:** Odd

**Course:** Cutting Edge Technologies Lab

**Course code:** 7CS352

**Practical No. 5**

**Exam Seat No:**

**Title of practical: Study and implementation of Synchronization constructs: critical, barrier, atomic, ordered, nowait.**

1. Write an OpenMP program where multiple threads increment a shared counter inside a loop.
   * Implement once without synchronization (observe wrong result).
   * Implement again using #pragma omp critical (correct result).
2. Write a program to compute the sum of an array of N=10^6 numbers in parallel.
   * First, use #pragma omp atomic to update the shared sum.
   * Compare runtime with #pragma omp critical.
3. Write a program with two parallel regions:
   * In the first part, each thread computes the square of its thread ID and stores it in an array.
   * Use a #pragma omp barrier to ensure all threads finish before the master thread prints the array.
4. Write a program to print numbers from 1 to 20 in ascending order using a parallel for loop.
   * Use #pragma omp ordered to maintain order.
   * Run the same code without ordered and compare the output.
5. Write a program with two parallel for loops inside the same parallel region:
   * First loop initializes an array.
   * Second loop immediately prints the array elements.
   * Use #pragma omp for nowait on the first loop and observe what happens (incorrect output).
   * Then remove nowait to fix the issue.
6. Write a program to calculate factorial of n in parallel using OpenMP.
   * Use critical or atomic for shared multiplication.
   * Then optimize using reduction.
7. Sum of squares of first 1 million numbers.

**Problem Statement 1:**

**Screenshots:**

**Information:**

**Analysis: Speedup calculation with various size of threads**

**Problem Statement 2:**

**Screenshots:**

**Information:**

**Analysis:**

**Problem Statement 3:**

**Screenshots:**

**Information:**

**Analysis:**

**Problem Statement 4:**

**Screenshots:**

**Information:**

**Analysis:**

**Github Link:**