FACULTY OF COMPUTER SCIENCE AND ENGINEERING
Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi

Lab Duration: 3 hrs. **CS417 Parallel Processing Lab (CS)** **Marks: 10**

Lab No: 05 **Instructor: Mr. Usman Haider** **Dated: 11/10/2023**

Before performing tasks, keep in mind the following rules:

1. **CHEATING IS NOT ALLOWED. Looking at someone else's screen is also cheating.**
2. **Mobile phone and internet usage are not allowed.**
3. **If you have any queries related to the task, you can ask instructors only. Never talk to each other until you are allowed.**
4. **Do not answer any query until you are asked.**
5. **Perform all the tasks.**
6. **Avoiding any of the above rules will lead to marks deduction.**

Note: For all questions, do all necessary exception handling.

Task 1: Create a parallel program that conducts matrix operations efficiently. The program should take size of both matrices (**Note: the matrix can be on any size, square matrices are not mandatory**), number of threads, as a command-line argument and perform the following operations: matrix multiplication, transposition of the result, and calculating sums for both the result matrix and the transposed matrix (this should also be done in parallel). Afterward, it should compare the row sums to verify if they are equal.

Task 2: Implement a program in C that performs binary search in parallel using OpenMP. The program should accept command-line arguments for the size of the array, the number to search, and the number of threads to use. Additionally, the program should generate a random array.

Sample Input:

```
. /parallel_binary_search 1000000 42 4
```

Sample output:

```
Generated an array of size 1000000.
Sorting the array ... Done.
Searching for the number 42...
Number 42 found at index 456789.
```