NATIONAL UNIVERSITY OF COMPUTER AND
EMERGING SCIENCES ISLAMABAD
OPERATING SYSTEMS Fall - 2022

ASSIGNMENT 03

Due Date: 11:55 PM, 26th Nov 2022.

Instructions

- *Zero marks will be awarded to the students involved in plagiarism.*
- *All the submissions will be done on Google classroom.*
- *You have to submit .c/.cpp files in Zip Folder named after your roll no (20I-XXXX.zip). Naming convention has to be followed strictly. Each question will be named as q1.cpp/q1.c.*
- *Be prepared for viva or anything else after the submission of assignment.*
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QUESTION NO. 01:

Write a program that takes a filename as input. The task is to count the number of alphabets in the mentioned file. You have to create 26 threads each thread will be responsible for the counting of a particular letter in the file. All threads will print their character count and also return the count, main thread will receive the count of each thread and print the sum which will be equivalent to no of characters in file. Character that thread has to count should be passed as input parameter to each thread.

QUESTION NO. 02:

You have learned merge sort in data structures which sorts an array in nlogn time, it is a divide and conquer technique. We can enhance the performance of merge sort using the multithreading. First of all, you have to check the processor cores of your system, let's suppose your system processor has 4 cores. Now you have to create 4 threads and divide the array among these threads and sort them using

merge sort. You have to take size of array and array elements from user. For this

question you have to print number of cores and mac address of your system at the start of program. No need to implement merge sort from scratch you can use merge sort code from internet but provide the link of source in the code.

Important: No of threads will be equivalent to no of cores in your system. We will verify no of cores and mac address at the time of demo, if anyone cores and mac address mismatched at the time of demo will be awarded zero marks.

QUESTION NO. 03:

Multiplication of matrix does take time surely. Time complexity of matrix multiplication is O (n^3) using normal matrix multiplication. But, is there any way to improve the performance of matrix multiplication using normal method. Multi-threading can be done to improve it. In multi-threading, instead of utilizing a single core of your processor, we utilize all or more core to solve the problem. You have to create different threads, each thread evaluating one element of resultant matrix.

$$A = \begin{pmatrix} -3 & -1 & -1 & -5 & 1 \\ -3 & -3 & -4 & -5 & 3 \\ -1 & -5 & 3 & -1 & -3 \\ 3 & 2 & -1 & -4 & -4 \\ -5 & 3 & -2 & -1 & -1 \end{pmatrix} \quad B = \begin{pmatrix} 0 & 5 & 3 & -3 & 0 \\ 5 & 5 & 2 & 0 & -1 \\ 3 & 0 & -4 & -1 & -4 \\ 4 & 0 & -3 & 2 & 4 \\ 4 & -2 & 0 & -1 & 3 \end{pmatrix}$$

$$AB = \begin{pmatrix} -24 & -22 & 8 & -1 & -12 \\ -35 & -36 & 16 & 0 & 8 \\ -32 & -24 & -22 & 1 & -20 \\ -25 & 33 & 29 & -12 & -26 \\ 1 & -8 & 2 & 16 & -2 \end{pmatrix}$$

The value 8 is calculated using only one thread so; you have to calculate each value of resultant matrix using a thread. Take two matrices (A and B of size 3x3 both) from user your resultant matrix is of size 3x3 you have to create 9 threads for calculation of each value of resultant matrix.