National Textile University

Department of Computer Science

Subject:

Operating System

Submitted To:

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Submitted By:

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Registration No:

23-NTU-CS-1163

Lab No:

7(Evaluation 1)

Semester:

5th

Source Code:

```c
/*
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Lab Evaluation 1
--------------------------------------------------------------------------
Question:
Write a C program that creates 4 threads. Each thread should:
1. Receive a unique number N as an argument (use values: 10, 20, 30, 40)
2. Calculate the sum of numbers from 1 to N
3. Print the thread number and calculated sum
4. Return the sum through thread's return value
-> Main thread should:
1. Create all 4 threads and pass arguments Wait for all threads to complete
2. Collect all return values
3. Calculate and print the total of all sums
*/

#include<stdio.h>
#include<stdlib.h>
#include<pthread.h>

void* calSum(void* arg){
    int N=*(int*)arg;
    int* sum = malloc(sizeof(int));
    *sum = 0;

    for(int i=1; i<=N; i++){
        *sum += i;
    }
    printf("Thread for N=%d, Calculated Sum: %d \n", N, *sum);
    pthread_exit(sum);
}
int main(){
    pthread_t threads[4];
    int nums[4] = {10,20,30,40};
    int* result;
    int totalSum = 0;
    printf("\n");
    for(int i=0; i<4; i++){
        pthread_create(&threads[i], NULL, calSum, &nums[i]);
    }

    for(int i=0; i<4; i++){
        pthread_join(threads[i], (void**)&result);
        totalSum += *result;
        free(result);
    }

    printf("\nMain Thread: Total of all sums = %d\n\n",totalSum);
    return 0;
}

/*
Remarks:
In this program, multithreading is demonstrated using pthreads.
The program creates four threads using pthread_create.
Each thread computes the sum of numbers from 1 to N and returns it to the main thread.
The main thread then aggregates all results by using pthread_join and prints the total sum.
*/
```

Output:

```
hafsatayyab@DESKTOP-L0JV4JP:~/OS-Labs/Lab Evaluation 1$ ./task1

Thread for N=10, Calculated Sum: 55
Thread for N=20, Calculated Sum: 210
Thread for N=30, Calculated Sum: 465
Thread for N=40, Calculated Sum: 820

Main Thread: Total of all sums = 1550

hafsatayyab@DESKTOP-L0JV4JP:~/OS-Labs/Lab Evaluation 1$
```

Brief Demonstration:

- This program demonstrates a multithreaded sum calculator using pthreads.
- In this program, I created 4 threads that calculate sums from 1 to N (N=10,20,30,40)
- Each thread computes: 1+2+3+...+N in parallel.
- Then, main thread collects all results and sums them.
- Thus, the final output is equal to the total of all individual sums (55+210+465+820=1550)
- Demonstrates: thread creation, argument passing, return values, and synchronization