SEM - VII - 2022-23
High-Performance Computing Lab
Assignment 4
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1. Analyse and implement a Parallel code for below programs using OpenMP considering synchronization requirements. (Demonstrate the use of different clauses and constructs wherever applicable)

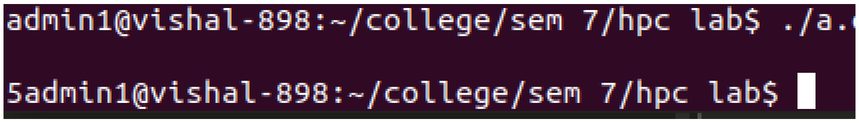
   //Fibonacci Series using Dynamic Programming

   Iterative cannot be parallized

   Recursive version

```
#include<stdio.h>
#include <omp.h>


int fib(int n)

{

        if (n == 1 || n == 0)
                return n;
        else
        {
                int i, j;

                #pragma omp task shared(i) firstprivate(n)
                i = fib(n - 1);

                #pragma omp task shared(j) firstprivate(n)
                j = fib(n - 2);

                #pragma omp taskwait
                return i + j;
        }
}

int main ()
```

```
{
    int n = 5;
    #pragma omp parallel shared(n)
    {
        #pragma omp single
        printf("\n%d", fib(n));
    }

    return 0;
}
```



```
admin1@vishal-898:~/college/sem 7/hpc lab$ ./a.

5admin1@vishal-898:~/college/sem 7/hpc lab$ 
```

2. Analyse and implement a Parallel code for below programs using OpenMP considering synchronization requirements. (Demonstrate the

use of different clauses and constructs wherever applicable)

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

// Initialize a mutex to 1
int mutex = 1;
// Number of full slots as 0a
int full = 0;
// Number of empty slots as size
// of buffer

int empty = 10, x = 0;
// Function to produce an item and
// add it to the buffer
void producer() {
    // Decrease mutex value by 1
    --mutex;
    // Increase the number of full
    // slots by 1
    ++full;
    // Decrease the number of empty
    // slots by 1
    --empty;
    // Item produced
    x++;
    printf("\nProducer produces "
           "item %d",
           x);
    // Increase mutex value by 1
    ++mutex;
}
// Function to consume an item and
// remove it from buffer
void consumer() {
    // Decrease mutex value by 1
    --mutex;
    // Decrease the number of full
    // slots by 1
    --full;
    // Increase the number of empty
    // slots by 1
    ++empty;
    printf("\nConsumer consumes "
           "item %d",
           x);
    x--;
    // Increase mutex value by 1
    ++mutex;
}
// Driver Code
int main() {
    int n, i;
    printf("\n1. Press 1 for Producer"
           "\n2. Press 2 for Consumer"
           "\n3. Press 3 for Exit");
// Using '#pragma omp parallel for'
// can give wrong value due to
// synchronization issues.
// 'critical' specifies that code is
// executed by only one thread at a
// time i.e., only one thread enters
// the critical section at a given time
    #pragma omp critical
    for (i = 1; i > 0; i++) {
        printf("\nEnter your choice:");
        scanf("%d", &n);
        // Switch Cases
        switch (n) {
        case 1:
            // If mutex is 1 and empty
            // is non-zero, then it is
            // possible to produce
            if ((mutex == 1) && (empty != 0)) {
                producer();
            }
            // Otherwise, print buffer
            // is full
            else {
                printf("Buffer is full!");
            }
            break;
        case 2:
            // If mutex is 1 and full
            // is non-zero, then it is
            // possible to consume
            if ((mutex == 1) && (full != 0)) {
                consumer();
            }
            // Otherwise, print Buffer
            // is empty
            else {
                printf("Buffer is empty!");
            }
            break;
        // Exit Condition
        case 3:
            exit(0);
            break;
        }
    }
}
```