

Written by : Chelouah.

Ref : ADEO-PROGPAP

For the students ADEO M1 (Yoola CHOI)

Created : 16/03/2020

Authorized notes : only one paper notes with A4 format

Examen le : 13/04/2020

Modalities

- You must write your copy with an ink pen only.
- All your belongings (bags, jackets, kit, etc.) must be placed at the front of the room.
- No question may be posed to the teachers, ask assumptions in doubt.
- No electronic machine must be on or near you, even off.
- No exchange of any kind whatsoever is possible.

Exercise 1 :

Let the following code

```
1  #include <omp.h>
2  #include <stdio.h>
3  #include <stdlib.h>
4
5  int a, b, tid;
6  float x;
7  #pragma omp threadprivate(a, x)
8
9  main () {
10
11     omp_set_dynamic(0);
12
13     #pragma omp parallel num_threads(4) private(tid)
14     {
15         tid = omp_get_thread_num();
16         a = tid;
17         b = tid;
18         x = 1.1 * tid + 1.0;
19         printf("Thread %d: a,b,x= %d %d %f\n",tid,a,b,x);
20     }
21     #pragma omp parallel private(tid)
22     {
23         tid = omp_get_thread_num();
24         printf("Thread %d: a,b,x= %d %d %f\n",tid,a,b,x);
25     }
26 }
```

1. Explain the line 7
2. Explain the line 11
3. Explain the 13
4. Let the following output of the first parallel block

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Thread 0: a,b,x= 0 1 1.000000

Thread 2: a,b,x= 2 3 3.200000

Thread 3: a,b,x= 3 3 4.300000

Thread 1: a,b,x= 1 2 2.100000

The result you seem Ok? Your comment?

If we want the following output, do we need to change something Yes or No? Justify your answer

Thread 0: a,b,x= 0 0 1.000000

Thread 2: a,b,x= 2 2 3.200000

Thread 3: a,b,x= 3 3 4.300000

Thread 1: a,b,x= 1 1 2.100000

5. After correcting if there is, given the output of the line 24

Exercise 2:

We recovered a code that initializes the content of an array A by the square of i and displays, then initializes the content by the cube i.

```
1 #include <omp.h>
2 #include <stdio.h>
3 #include <stdlib.h>
4 int main( ) {
5     int A[5], i;
6     #pragma omp parallel
7     {
8         #pragma omp for
9         for (i = 0; i < 5; i++)
10            A[i] = i * i;
11        #pragma omp master
12        for (i = 0; i < 5; i++)
13            printf("a[%d] = %d\n", i, A[i]);
14        #pragma omp for
15        for (i = 0; i < 5; i++)
16            A[i] = i * i * i;
17    }
18 }
```

Is this code gives the desired result? Otherwise what does it add and where?

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Exercise 3

We want to calculate the trace of a square matrix A_n (the trace of a matrix is the sum of its diagonal elements).

1. Give the sequential code.
2. What is the concurrent variable?
3. Provide different ways of managing synchronization (access to the shared variable).
4. Parallelize the code using the OpenMP API

Exercise 4

Let a table T with the size L randomly filled with integer numbers less than N . We want to calculate the number of prime numbers in this table. We suppose that have at our disposal a function $isPrime(m)$ that returns 1 if m is prime otherwise it returns a 0. Suppose we have P processes, and we want to parallelize this treatment. Write the OpenMp code to do it.