DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL

Parallel Programming

LAB 1 – 27th July 2021

Note: Observe the results of each program, take the screenshot of the result and upload it in the Moodle. Total Marks [10]

Note:

parallel

Forms a team of threads and starts parallel execution.

#pragma omp parallel *[clause[[,]clause] ...]*
structured-block
clause:
if(*scalar-expression*)
num_threads(*integer-expression*)
default(**shared** | **none**)
private(*list*)
firstprivate(*list*)
shared(*list*)
copyin(*list*)
reduction(*reduction-identifier*: *list*)

I. Finding number of CPU s in system **[3 Marks]**

a) lscpu command

```
  $ lscpu
$ lscpu | egrep 'Model name|Socket|Thread|NUMA|CPU\(s\)'
$ lscpu -p
```

b) Run top or htop command to obtain the number of CPUs/cores in linux

```
$top
```

c) Execute nproc and print the number of CPUs available on Linux

```
      $ nproc --all
      $ echo "Threads/core: $(nproc --all)"
```

2.Write a C/C++ simple parallel program to display the *thread_id* and total number of threads. [3 Marks]

```
/*simpleomp.c*/
#include<omp.h>
int main(){
int nthreads,tid;
#pragma omp parallel private(tid)
{
tid=omp_get_thread_num();
printf("Hello world from thread=%d\n",tid);
if(tid==0)
{
  nthreads=omp_get_num_threads();
printf("Number of threads=%d\n",nthreads);
}
}
}
```

Execute the program as follows:

```
$gcc –o simple –fopenmp simpleomp.c

$export OMP_NUM_THREADS=2

$./simple
```

Note down the output in your observation book.

Number of threads in a parallel region is determined by the *if* clause, *num_threads(), omp_set_num_threads(), OMP_NUM_THREADS.*

Use these various methods to set number of threads and mention the method of setting the same.

2. Check the output of following program and Note down the output in your observation book. [2 Marks]

```
 /*ifparallel.c*/

#include<omp.h>
int main(){
int val;
printf("Enter 0: for serial 1: for parallel\n");
scanf("%d",&val);
#pragma omp parallel if(val)
{
```

```
if(omp_in_parallel())
printf("Parallel val=%d id= %d\n",val, omp_get_thread_num());
else
printf("Serial val=%d id= %d\n",val, omp_get_thread_num());
}
}
```

3.Observe and record the output of following program [2 Marks]

```
 /*num_threads.c*/
#include<omp.h>
int main(){
#pragma omp parallel num_threads(4)
{
int tid=omp_get_thread_num();
printf("Hello world from thread=%d\n",tid);
}
}
```

Change the num_threads and observe the result.