Date:30.08.2022

Final Year B. Tech., Sem VII 2021-22

High Performance Computing Lab

Assignment submission

PRN No: 2019BTECS00064

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Batch: B3

Assignment: 1

Title of assignment: Use of OpenMP in C

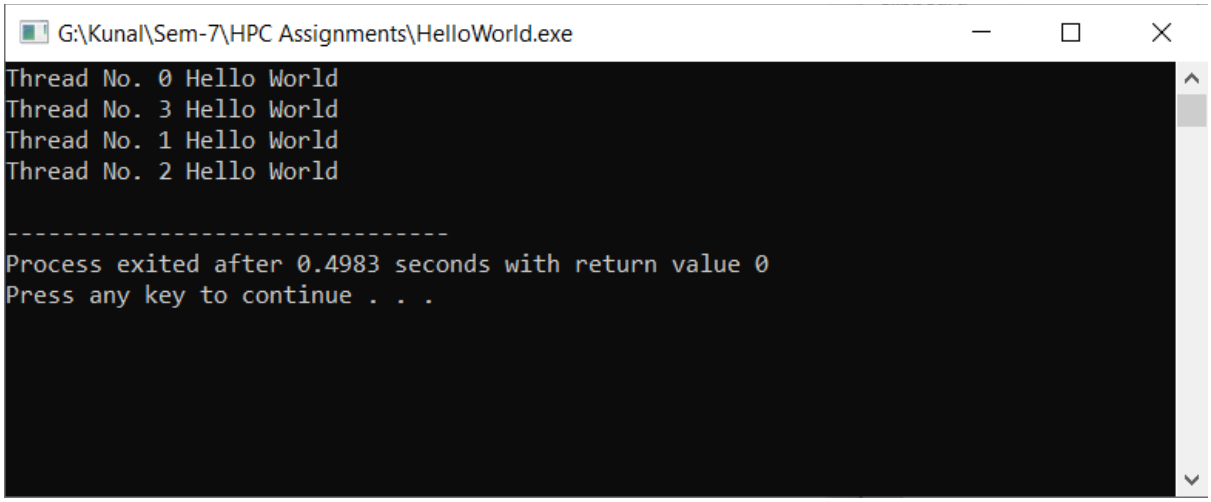
1. Write a program that prints Hello World using OpenMP

Ans:

Code:

```
#include<omp.h>
#include<bits/stdc++.h>

int main(int argc, char* argv[])
{
	#pragma omp parallel
	{
		printf("Thread No. %d Hello World\n",
omp_get_thread_num());
	}
	return 0;
}
```

Output:


G:\Kunal\Sem-7\HPC Assignments\HelloWorld.exe
Thread No. 0 Hello World
Thread No. 3 Hello World
Thread No. 1 Hello World
Thread No. 2 Hello World

Process exited after 0.4983 seconds with return value 0
Press any key to continue . . .

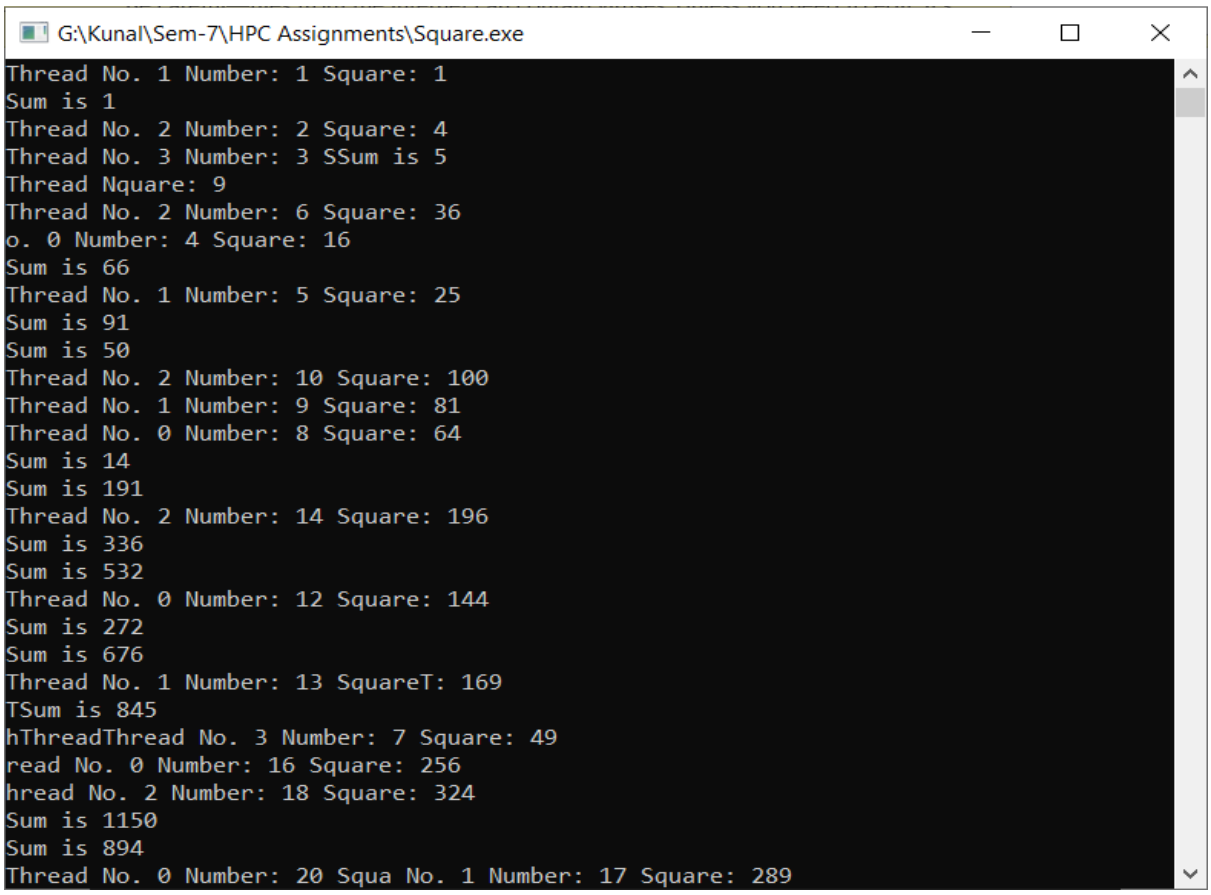
2. Write a program that print the square an their sum using the OpenMP

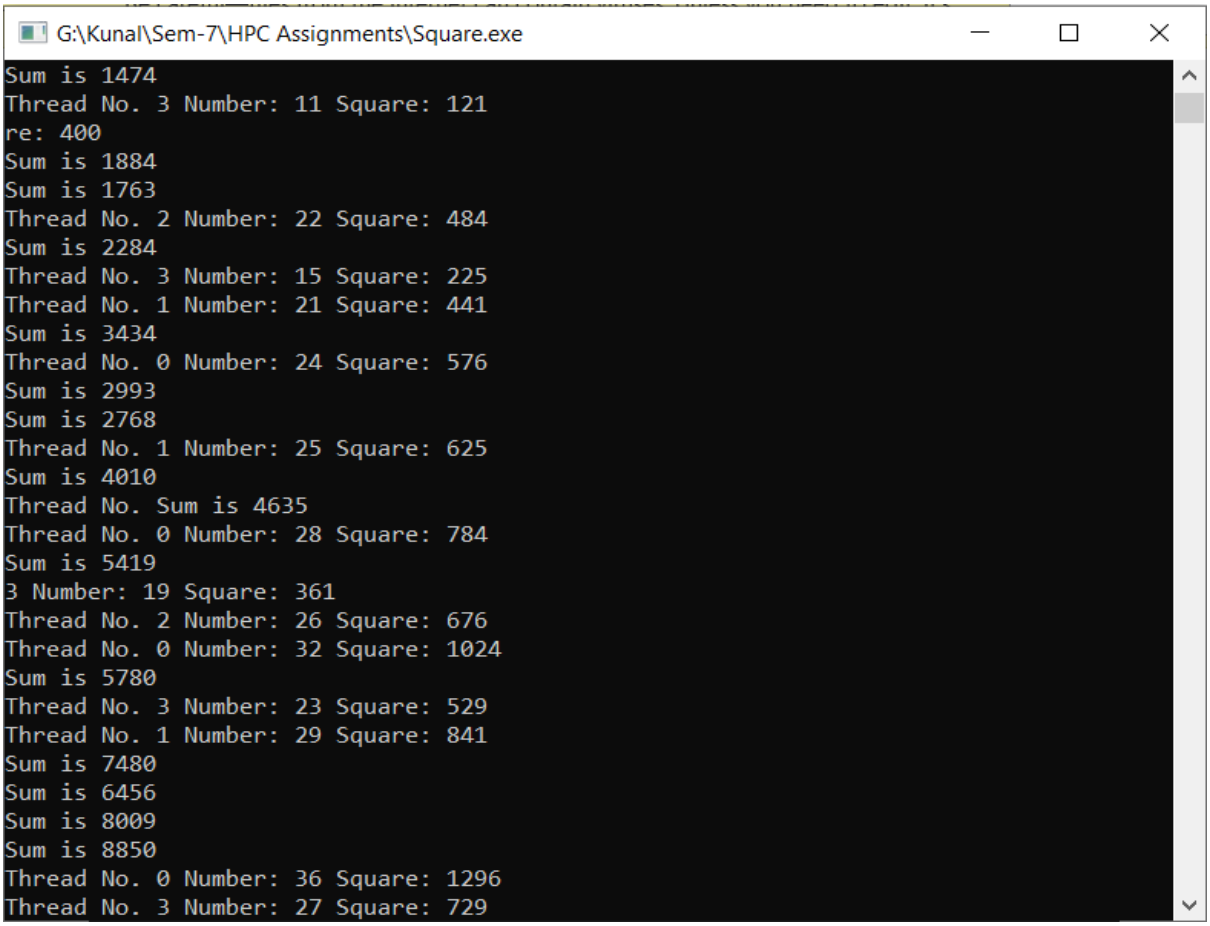
Ans:

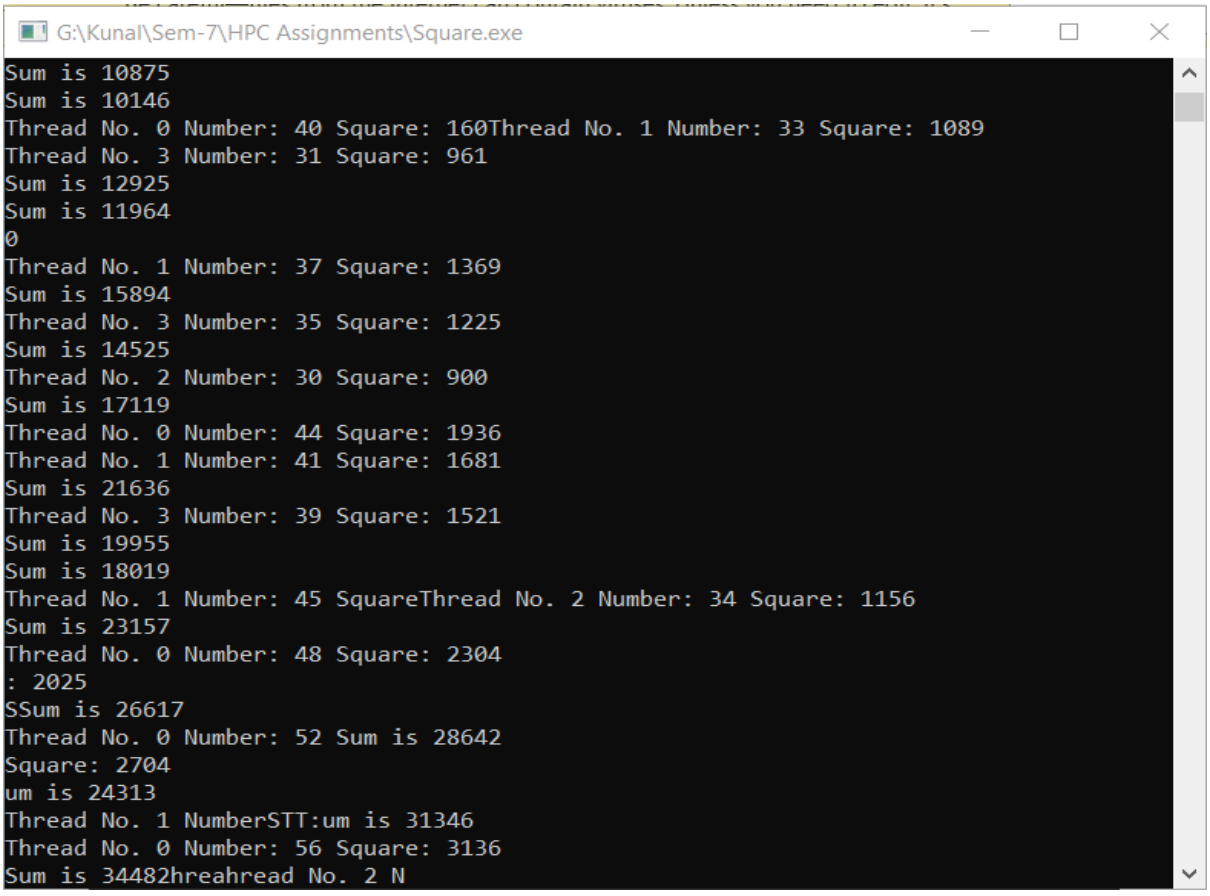
Code:

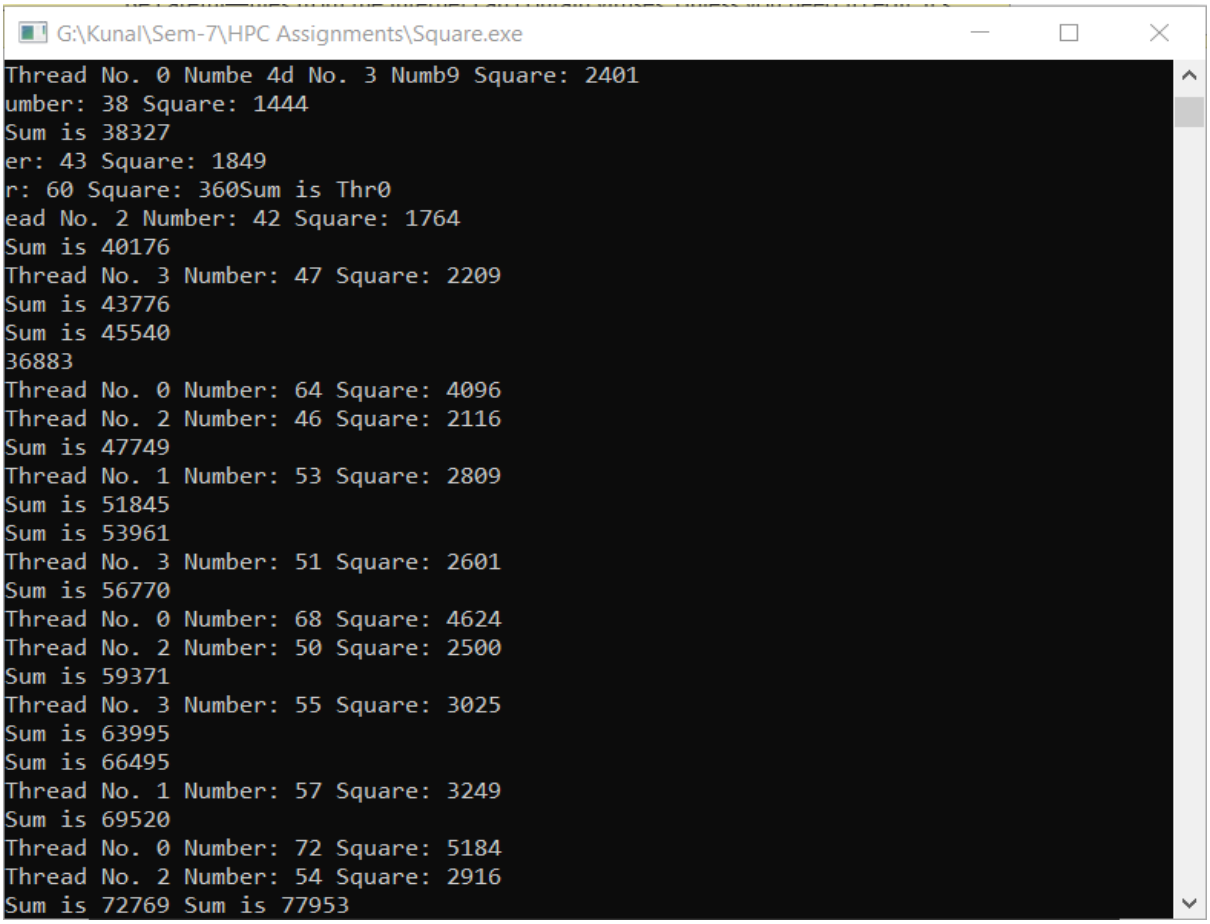
```
#include<omp.h>
#include<bits/stdc++.h>

static int sum = 0;

int main()
{
	#pragma omp parallel
	{
		for(int i = 1;i <= 100;i++)
		{
			if(i % 4 == omp_get_thread_num())
			{
				printf("Thread No. %d Number: %d
Square: %d \n",omp_get_thread_num(), i , i*i);
				sum += i*i;
				printf("Sum is %d \n" ,sum);
			}
		}
	}
	return 0;
}
```

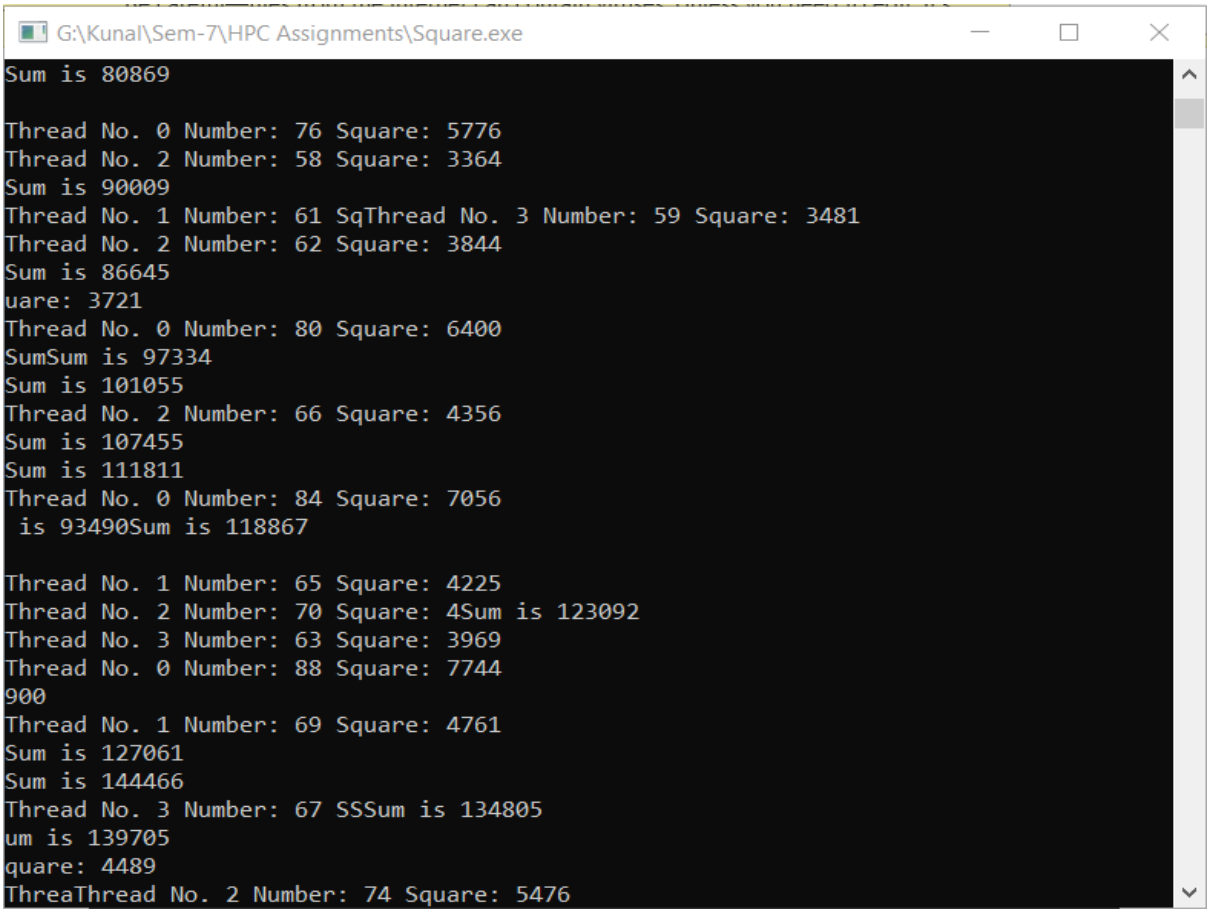
Output:

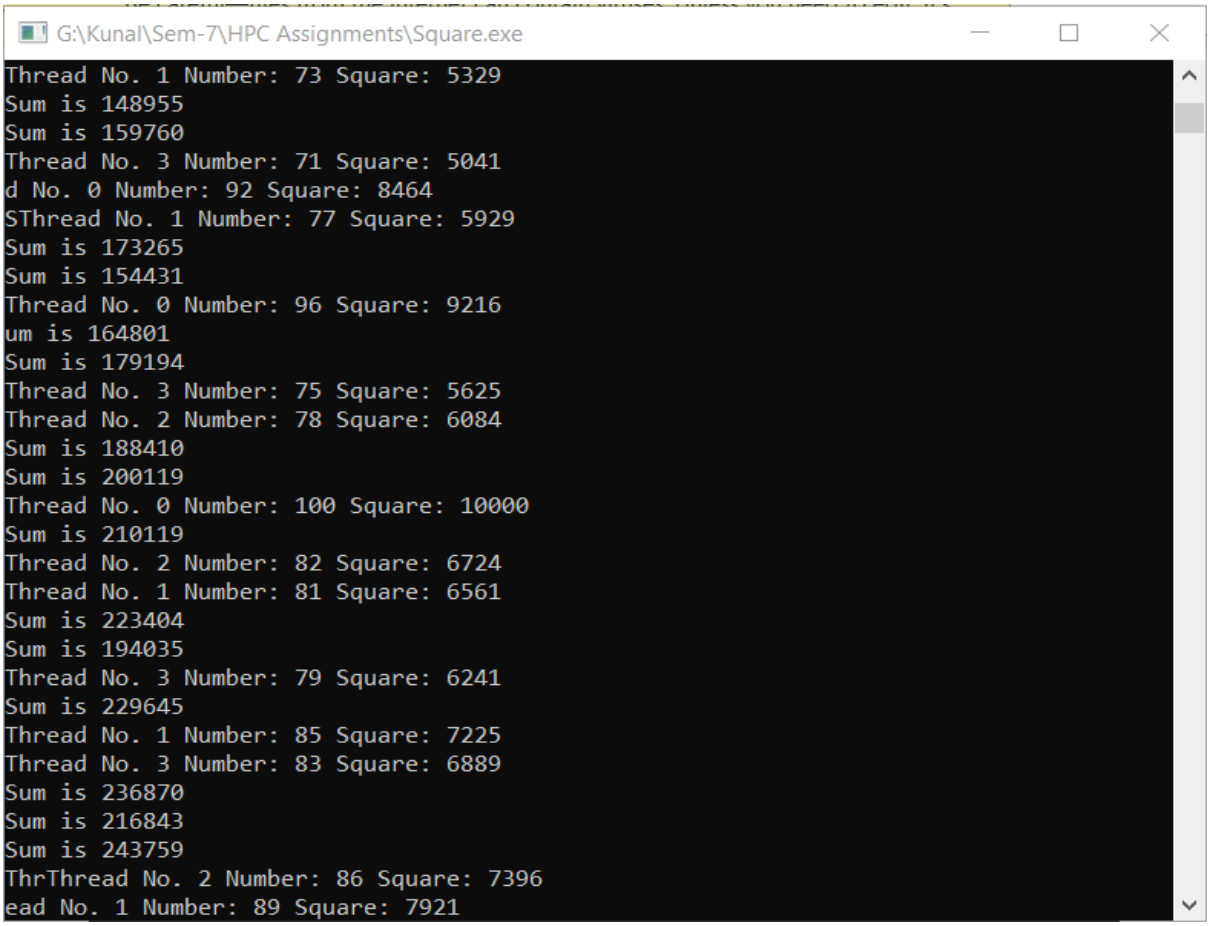

G:\Kunal\Sem-7\HPC Assignments\Square.exe
Thread No. 1 Number: 1 Square: 1
Sum is 1
Thread No. 2 Number: 2 Square: 4
Thread No. 3 Number: 3 SSum is 5
Thread Nquare: 9
Thread No. 2 Number: 6 Square: 36
o. 0 Number: 4 Square: 16
Sum is 66
Thread No. 1 Number: 5 Square: 25
Sum is 91
Sum is 50
Thread No. 2 Number: 10 Square: 100
Thread No. 1 Number: 9 Square: 81
Thread No. 0 Number: 8 Square: 64
Sum is 14
Sum is 191
Thread No. 2 Number: 14 Square: 196
Sum is 336
Sum is 532
Thread No. 0 Number: 12 Square: 144
Sum is 272
Sum is 676
Thread No. 1 Number: 13 SquareT: 169
TSum is 845
hThreadThread No. 3 Number: 7 Square: 49
read No. 0 Number: 16 Square: 256
hread No. 2 Number: 18 Square: 324
Sum is 1150
Sum is 894
Thread No. 0 Number: 20 Squa No. 1 Number: 17 Square: 289

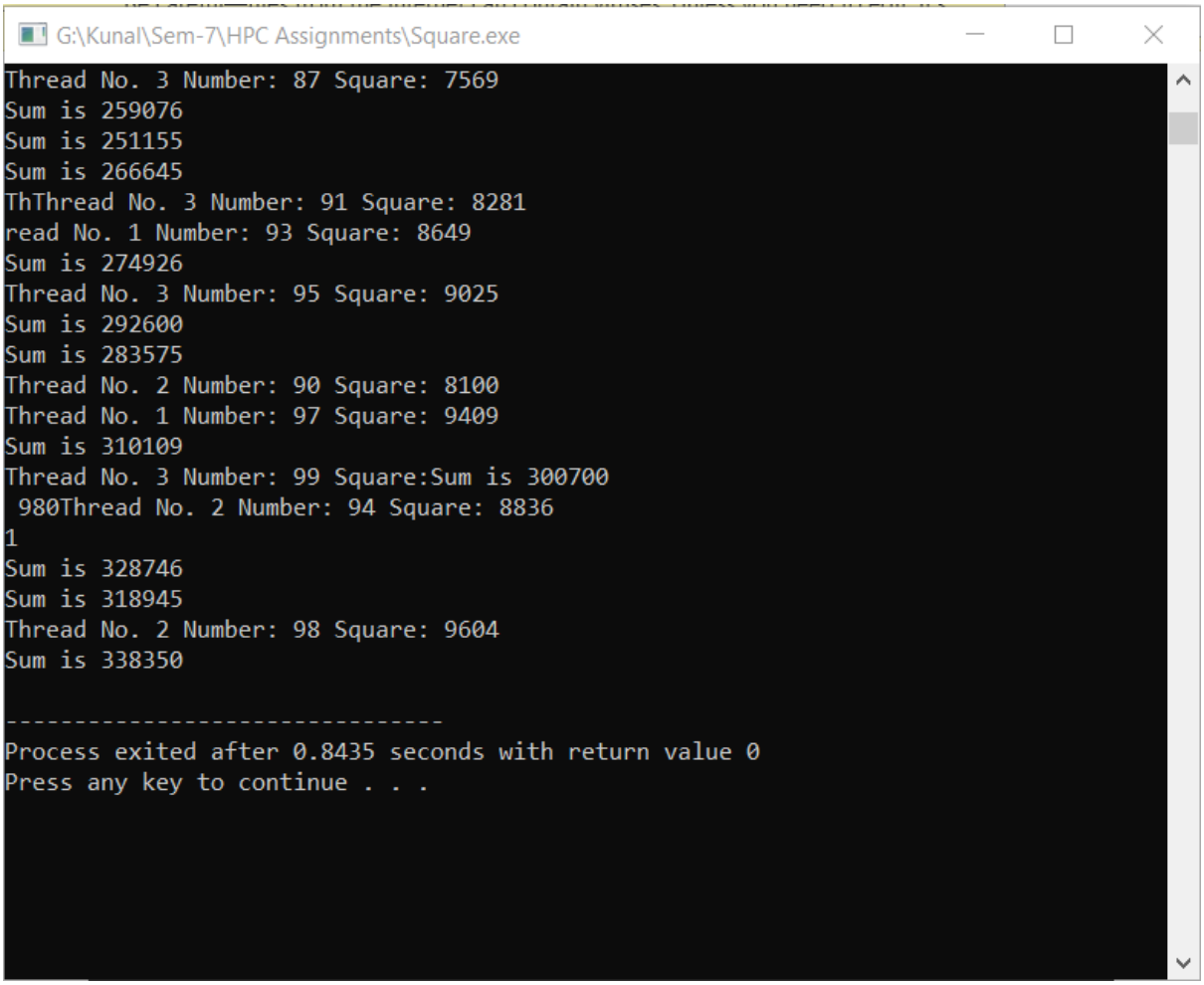

G:\Kunal\Sem-7\HPC Assignments\Square.exe
Sum is 1474
Thread No. 3 Number: 11 Square: 121
re: 400
Sum is 1884
Sum is 1763
Thread No. 2 Number: 22 Square: 484
Sum is 2284
Thread No. 3 Number: 15 Square: 225
Thread No. 1 Number: 21 Square: 441
Sum is 3434
Thread No. 0 Number: 24 Square: 576
Sum is 2993
Sum is 2768
Thread No. 1 Number: 25 Square: 625
Sum is 4010
Thread No. Sum is 4635
Thread No. 0 Number: 28 Square: 784
Sum is 5419
3 Number: 19 Square: 361
Thread No. 2 Number: 26 Square: 676
Thread No. 0 Number: 32 Square: 1024
Sum is 5780
Thread No. 3 Number: 23 Square: 529
Thread No. 1 Number: 29 Square: 841
Sum is 7480
Sum is 6456
Sum is 8009
Sum is 8850
Thread No. 0 Number: 36 Square: 1296
Thread No. 3 Number: 27 Square: 729


G:\Kunal\Sem-7\HPC Assignments\Square.exe
Sum is 10875
Sum is 10146
Thread No. 0 Number: 40 Square: 160Thread No. 1 Number: 33 Square: 1089
Thread No. 3 Number: 31 Square: 961
Sum is 12925
Sum is 11964
0
Thread No. 1 Number: 37 Square: 1369
Sum is 15894
Thread No. 3 Number: 35 Square: 1225
Sum is 14525
Thread No. 2 Number: 30 Square: 900
Sum is 17119
Thread No. 0 Number: 44 Square: 1936
Thread No. 1 Number: 41 Square: 1681
Sum is 21636
Thread No. 3 Number: 39 Square: 1521
Sum is 19955
Sum is 18019
Thread No. 1 Number: 45 SquareThread No. 2 Number: 34 Square: 1156
Sum is 23157
Thread No. 0 Number: 48 Square: 2304
: 2025
SSum is 26617
Thread No. 0 Number: 52 Sum is 28642
Square: 2704
um is 24313
Thread No. 1 NumberSTT:um is 31346
Thread No. 0 Number: 56 Square: 3136
Sum is 34482hreahread No. 2 N


G:\Kunal\Sem-7\HPC Assignments\Square.exe
Thread No. 0 Numbe 4d No. 3 Numb9 Square: 2401
umber: 38 Square: 1444
Sum is 38327
er: 43 Square: 1849
r: 60 Square: 360Sum is Thr0
ead No. 2 Number: 42 Square: 1764
Sum is 40176
Thread No. 3 Number: 47 Square: 2209
Sum is 43776
Sum is 45540
36883
Thread No. 0 Number: 64 Square: 4096
Thread No. 2 Number: 46 Square: 2116
Sum is 47749
Thread No. 1 Number: 53 Square: 2809
Sum is 51845
Sum is 53961
Thread No. 3 Number: 51 Square: 2601
Sum is 56770
Thread No. 0 Number: 68 Square: 4624
Thread No. 2 Number: 50 Square: 2500
Sum is 59371
Thread No. 3 Number: 55 Square: 3025
Sum is 63995
Sum is 66495
Thread No. 1 Number: 57 Square: 3249
Sum is 69520
Thread No. 0 Number: 72 Square: 5184
Thread No. 2 Number: 54 Square: 2916
Sum is 72769 Sum is 77953


G:\Kunal\Sem-7\HPC Assignments\Square.exe
Sum is 80869
Thread No. 0 Number: 76 Square: 5776
Thread No. 2 Number: 58 Square: 3364
Sum is 90009
Thread No. 1 Number: 61 SqThread No. 3 Number: 59 Square: 3481
Thread No. 2 Number: 62 Square: 3844
Sum is 86645
uare: 3721
Thread No. 0 Number: 80 Square: 6400
SumSum is 97334
Sum is 101055
Thread No. 2 Number: 66 Square: 4356
Sum is 107455
Sum is 111811
Thread No. 0 Number: 84 Square: 7056
is 93490Sum is 118867
Thread No. 1 Number: 65 Square: 4225
Thread No. 2 Number: 70 Square: 4Sum is 123092
Thread No. 3 Number: 63 Square: 3969
Thread No. 0 Number: 88 Square: 7744
900
Thread No. 1 Number: 69 Square: 4761
Sum is 127061
Sum is 144466
Thread No. 3 Number: 67 SSSum is 134805
um is 139705
quare: 4489
ThreaThread No. 2 Number: 74 Square: 5476


G:\Kunal\Sem-7\HPC Assignments\Square.exe
Thread No. 1 Number: 73 Square: 5329
Sum is 148955
Sum is 159760
Thread No. 3 Number: 71 Square: 5041
d No. 0 Number: 92 Square: 8464
SThread No. 1 Number: 77 Square: 5929
Sum is 173265
Sum is 154431
Thread No. 0 Number: 96 Square: 9216
um is 164801
Sum is 179194
Thread No. 3 Number: 75 Square: 5625
Thread No. 2 Number: 78 Square: 6084
Sum is 188410
Sum is 200119
Thread No. 0 Number: 100 Square: 10000
Sum is 210119
Thread No. 2 Number: 82 Square: 6724
Thread No. 1 Number: 81 Square: 6561
Sum is 223404
Sum is 194035
Thread No. 3 Number: 79 Square: 6241
Sum is 229645
Thread No. 1 Number: 85 Square: 7225
Thread No. 3 Number: 83 Square: 6889
Sum is 236870
Sum is 216843
Sum is 243759
ThrThread No. 2 Number: 86 Square: 7396
ead No. 1 Number: 89 Square: 7921


G:\Kunal\Sem-7\HPC Assignments\Square.exe
Thread No. 3 Number: 87 Square: 7569
Sum is 259076
Sum is 251155
Sum is 266645
ThThread No. 3 Number: 91 Square: 8281
read No. 1 Number: 93 Square: 8649
Sum is 274926
Thread No. 3 Number: 95 Square: 9025
Sum is 292600
Sum is 283575
Thread No. 2 Number: 90 Square: 8100
Thread No. 1 Number: 97 Square: 9409
Sum is 310109
Thread No. 3 Number: 99 Square:Sum is 300700
980Thread No. 2 Number: 94 Square: 8836
1
Sum is 328746
Sum is 318945
Thread No. 2 Number: 98 Square: 9604
Sum is 338350

Process exited after 0.8435 seconds with return value 0
Press any key to continue . . .

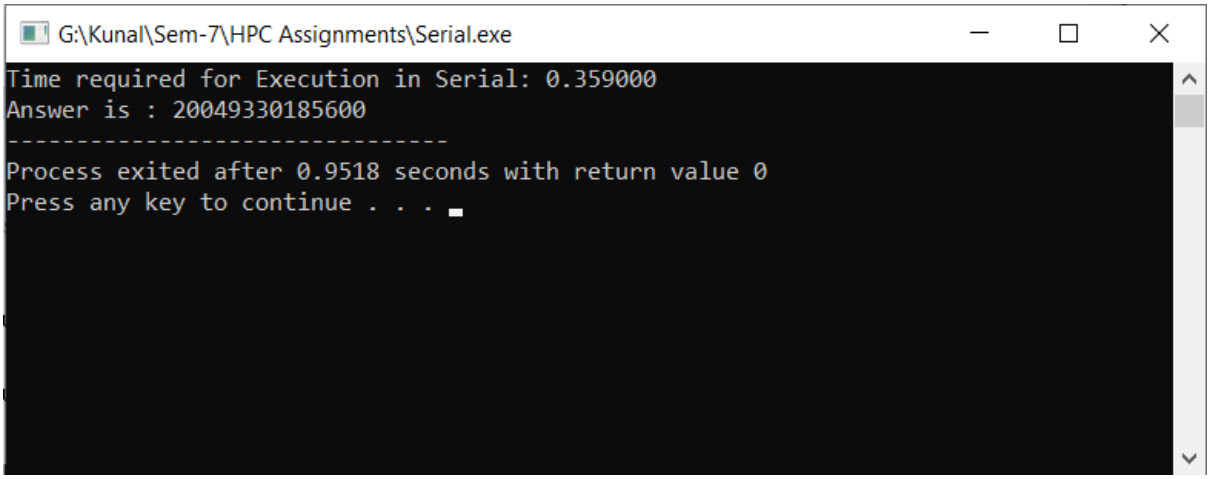
3. Write serial and parallel program and check their time for the execution

Ans:

Serial Code:

```
#include<bits/stdc++.h>
#include<omp.h>

int main()
{
	long long sum =0 ;

	double inTime = omp_get_wtime();

	int i;

	for(i=1;i <= 100000000;i++)
		sum += (i*i);

	double outTime = omp_get_wtime();

	double expcTime = outTime - inTime;

	printf("Time required for Execution in Serial: %f\n",
expcTime);
	printf("Answer is : %lld",sum);

	return 0;
}
```

Output:



Parallel Code:

```
#include<bits/stdc++.h>
#include<omp.h>

int main()
{
	long long sum = 0;

	double getInTime = omp_get_wtime();

	#pragma omp parallel for reduction(+ : sum)

	for (int i=1;i <= 100000000; i++)
		sum += i*i;

	double getOutTime = omp_get_wtime();

	double exptTime= getOutTime - getInTime;

	printf("Time required for Execution in Parallel: %f\n",
exptTime);

	printf("Answer is: %lld", sum);
```

```
        return 0;
    }
```

Output: