I D NO.	

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Weightage: 40 % Max Marks: 80 Max Time: 2 Hrs. 11 May 2018,Friday

ENDTERM FINAL EXAMINATION MAY 2018

Even Semester 2017-18 Course: **CSE 305 Parallel Computing** VI Sem CSE

Instructions:

(i) Read the question properly and answer accordingly.

(ii) Question paper consists of 3 parts.

Part A

(5 Q x 6 M = 30 Marks)

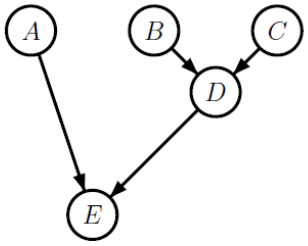
1. Consider the program given below. Convert it into hybrid program to work on four dual core processors. Show the trace for the same on quad core processor.

```
for(i=0;i<n;i++)
  a[i]=b[i]+c[i]
```

2. Consider the program. Parallelize the program as much as possible using Openmp.

```
C[0] = 1;
for (i=1;i<N;i++){
C[i] = C[i-1];
for (j=0;j<N;j++){
C[i] *= A[i,j] + B[i,j];
}}
```

3. Give the merits and demerits of Shared model and Message passing model for parallelism.
4. Consider 5 functions A,B,C,D and E are required to execute as shown by the dependency tree given below.



Write an OpenMP program which enable these function to execute in parallel. Exploit the parallelism as much as possible but by adhering to the dependency graph.

5. Write a MPI program to illustrate the scenario where the processor may enter Deadlock condition.

Part B

(2 Q x 15 M = 30 Marks)

6. The partial MPI program given below will compute the sum of n element in an array on NP number of processes. The logic used will not work on all the test cases.
   a. Give an example where this program will work correctly.
   b. Give an example where this program fail to execute correctly.
   c. Modify the program to work on all test cases.

```
MPI_Bcast(&fact, 1,MPI_INT, 0,MPI_COMM_WORLD);
if(myRank==0){          lower = 1;    }
   else          {      lower = myRank * (fact / size) + 1; }

if(myRank==(size-1)) { upper = fact; }
else { upper = (myRank + 1) * (fact / size); }

for(i=lower;i<=upper;i++){      local_result = local_result * (double)i;     }

MPI_Reduce(&local_result,&total, 1, MPI_DOUBLE, MPI_PROD, 0, MPI_COMM_WORLD ) ;
```

7. Write a MPI program to read n elements of the array. If even processor, find square of the corresponding elements. If odd processor, find cube of corresponding elements.

Part C

(1 Q x 20 M = 20 Marks)

8. Consider the program and the array x given below. Give the trace of execution on a mesh topology of size 12.

x=

2	4	45	34	12	16	11	22	37	6	5	4	12	9	77	15	13	28	30	19

```
for (s=2; s<2*n; s*=2)
  for (i=0; i<n-s/2; i+=s)
    x[i] += x[i+s/2]
```

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PRESIDENCY UNIVERSITY, BENGALURU

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Weightage: 20% Max Marks: 40 Max Time: 1 hr. 28 March Wednesday 2018

TEST – 2 **SET A**

Even Semester 2017-18 Course: **CSE 305 Parallel Computing** VI Sem. CSE

Instruction:

(i) Read the question properly and answer accordingly.

(ii) Question paper consists of 3 parts.

(iii) Scientific and Non-programmable calculators are permitted

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Part A

(2Q x 4 M = 8 Marks)

1. What is reduction? Give an example of a realistic use of reduction in OpenMP.

2. Explain the use of nowait and barrier in OpenMP with an example.

Part B

(3Q x 7 M = 21 Marks)

3. Explain the working of following partial parallel program written in OpenMP.

```
num_threads(4);
#pragma omp for collapse(2)
for(i=1;i<=4;i++)
for(j=1;j<=4;j++)
 a[i][j]=i+j;
```

4. Explain the process of parallelizing following C code using OpenMP.

```
double area, pi, x;
int i, n;
area = 0.0;
for (i = 0; i < n; i++) {
x = (i+0.5)/n;
area += 4.0/(1.0 + x*x);
}
pi = area / n;
```

5. Explain the process of parallelizing the following C program using OpenMP. Assume Fun1(), Fun2() , Fun3(), Fun4() and Fun5() are implemented and can be called from main program.

```
int main( )
{
int a,b,c,d,e;
a=Fun1();
b=Fun2();
c=Fun3();
d=Fun4(a,b);
e=Fun5(c,d);
printf(" the output of the program is %d",e);
}
```

Part C

(1Q x 11 M = 11 Marks)

6. Explain the process of parallelizing following C code using OpenMP. There is a dependency between the iterations of the outer loop. Modify the program to avoid dependency and to accommodate parallelism. Show the trace of execution of the modified program.

```
int main()
{
 int i, j, sf,  a[10][10];
a[0][0]=3;
 a[1][0]=4;
   for(i=2;i<10;i++)
        for(j=0;j<10;j++)
        {
          sf=i*j+(10-j);
          a[i][j]=sf*a[i-2][[j];
        }
}
```

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PRESIDENCY UNIVERSITY, BENGALURU

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Weightage: 20 % Max Marks: 40 Max Time: 1 hr. 20 Feb Tuesday 2018

TEST – 1

Even Semester 2017-18 Course: CSE **305 Parallel Computing** VI Sem. CSE

Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted

Part A

(4Q x 3 M= 12 Marks)

1. Give 3 strong reasons to justify the need parallel programming?
2. The Memory system not the processor Speed is bottleneck for many applications for improved performance. Explain
3. Give four steps in designing parallel program (Foster's design methodology).
4. Explain the role of compiler to support parallel programming in VLIW architecture.

Part B

(2 Q x 8 M= 16 Marks)

5. Consider the following piece of program code

```
for i = 0 to N-1
{
X[i] = (A[i] + B[i]) * C[i]
sum = sum + A[i]
}
```

i. Why do you think the above program code can be parallelizable?
ii. If you are given 8 processors and EREW PRAM, give the trace of parallel execution of the program on following arrays if the memory is shared.

A[i]	1	0	1	0	1	0	1	0
B[i]	2	3	4	5	6	7	8	9
C[i]	1	2	6	7	8	3	4	5

6. If 24 elements and 5 processors are given to do some computations, Explain how block data decomposition will happen if following technique is used.
   i) Grouped data decomposition ii) Distributed data decomposition.

Part C

(1 Q x 12 M= 12 Marks)

7.
   i. Give the butterfly network topology with 4 i.e.(2^2)processors .
   ii. Discuss the Bisection and Diameter for this topology.
   iii. Explain how processor 0 will communicate with processor 3.