Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CSE)/SEM-7/CS-704C/2011-12

2011

PARALLEL PROGRAMMING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) NUMA is a kind of
   a) SISD b) MISD
   c) SIMD d) MIMD.

   ii) In which kind of processor architecture degree is fixed ?
   a) Hypercube b) 2D-mesh
   c) Pyramid d) Hyper-tree.

   iii) Matrix multiplication in hypercube network takes time of
   a) $O(n^2)$ b) $O(n \log n)$
   c) $O(n)$ d) $O(\log n)$.

   iv) Which of the following is not a synchronizing technique ?
   a) Barrier b) Exclude directive
   c) Spin lock d) Critical directive.

v) Omega network is the other name of
   a) Shuffle-exchange network
   b) Butterfly network
   c) Hyper-tree network
   d) De Bruijin's network.

vi) Which of the following is a biotonic sequence ?

a)

1	4	3	7	8	3	6	4

b)

1	2	3	4	5	6	7	8

c)

3	4	5	6	4	5	4	3

d)

4	7	1	8	2	6	9	3

vii) Which one of the following is a true data dependency ?
   a) Flow data dependence
   b) Anti-data dependence
   c) Conditional dependence
   d) Output data dependence.

viii)
```
for( i=0; i<100; i++ )
    for( j=0; j<100; j++ )
    {
    a[i][i] = b[i][j];
    }
```
This block has
   a) good spatial and temporal locality
   b) good spatial but bad temporal locality
   c) good temporal but bad spatial locality
   d) none of these.

ix) You have a 1024 number of integers' array where each integer occupies two bytes. You have 32 processors in hand each having L2 cache (128 bytes). How will you interleave the array ?

a) In single integer slices b) In 64 integer slices

c) In 128 integer slices d) In 32 integer slices.

x) Which of the following statements is true ?

a) Coarse granularity implies tight coupling.

b) Granularity has no relation with coupling.

c) Fine granularity implies tight coupling.

d) Find granularity implies loose coupling.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Write down the differences between processor array and multiprocessor.
3. State Amdahl's law. Comment on super linear speed up.
4. Why is synchronization required ? What do you mean by barrier synchronization ?
5. What do you mean by cache coherence ? What is false sharing ?
6. What is cost and speed up ? What do you think it more and important factor in Parallel Programming and why ?

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Explain the PRAM model for Parallel Programming.

   b) What is the classification of PRAM model ? 9 + 6

8. Write down the matrix multiplication algorithm in a 2D mesh. Explain with an example. Calculate the time complexity. 8 + 7

9. Write a PRAM algorithm to calculate prefix sum of n integers. Write down which type of classification you are working with and justify your answer. 7 + (3 + 5)

10. a) What do you mean by loop carried dependency ?

    b) Draw the dependency graph of the following loop :

```
for ( i=0, i<200; i++ )
  a [i]=a[i]+a[200-i];
```

    c) How can the loop carried dependency you found above, be taken care of ? 5 + 6 + 4

11. Write short notes on any *three* of the following : 3 × 5

    a) FLYNN's taxomany

    b) Biotonic sequence

    c) Cache coherence management

    d) Discrete event time simulation

    e) Superscalar architecture.

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