



Name :

Roll No. :

Invigilator's Signature :

CS/MCA/SEM-5/MCAE-501C/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 × 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 hyper cube 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++)

{

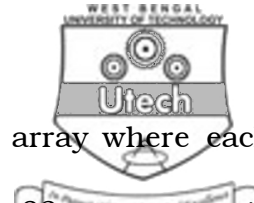
a [i] [i] = b [i] [j] ;

}

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.

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ix) You have a 1024 number of integer 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) Fine granularity implies loose coupling.



GROUP – B

(Short Answer Type Questions)

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

2. a) What are RAM and PRAM machines ? 2
- b) Explain the difference between the READ, WRITE and EXECUTE steps of a RAM and a PRAM. 3
3. a) Explain the instruction level pipelining mechanism used in parallel computing. 2
- b) Derive the ratio for pipelined execution versus non-pipelined execution. 3
4. a) What do we mean by the speed-up of a parallel computation ? What are the factors affecting the speed-up factor ? What are super-linear and sub-linear speed-ups ? $1 + 1 + 1$
- b) State and prove the Amdahl's law. 2
5. a) Explain the need of cache-coherency in multiprocessor systems. 2
- b) Explain any one method of resolving the cache-coherency issue. 3
6. Draw the data flow graph of the following expression evaluation :

$$F = (a - b) * (a + c) / (d - e).$$

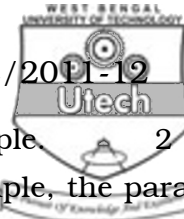


GROUP – C

(Long Answer Type Questions)

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

7. a) What do we mean by concurrent memory access ? Can we read as well as write concurrently to a memory location ? 1 + 1
- b) Briefly explain the four categories into which concurrent memory accesses can be classified. 2
- c) What is a conflict concerning concurrent memory access ? Give examples. 2
- d) Briefly explain any three techniques used to resolve conflicts arising out of concurrent memory accesses. 4
- e) Write and explain, with a suitable example, the algorithm for the parallel implementation of the Enumeration Sort method. 5
8. a) What do we mean by Parallel Programming ? Why do we need it ? What is a Processing Element ? 2 + 2 + 1
- b) Explain all the categories of Flynn's classification of computer systems. Give suitable examples. 5
- c) How do we differentiate between tightly coupled and loosely coupled MIMDs ? 3
- d) What is parallel overhead ? 2



9. a) What is Prefix computation ? Give example. 2 + 1
 b) Write and explain, with a suitable example, the parallel implementation of the Prefix Computation method. Show the intermediate steps. Is the method cost optimal ? 2 + 4 + 1
 c) Draw and explain the basic Von-Neumann Computer architecture. 3
 d) How are multi-processors different from multi-computers ? 2
10. a) Explain the VLIW Architecture. Explain how pipelining is incorporated in VLIW Architecture for a degree $m = 3$. 7
 b) Make the dependence graph of the following program segment : 8

S1 : $C = D \times E$

S2 : $M = G + C$

S3 : $A = B + C$

S4 : $C = L + M$

S5 : $F = G \div E$.

11. Write short notes on any *three* from the following : 3 × 5
- a) Parallel Odd-Even Transposition Sort
 b) Barrier Synchronization
 c) UMA and NUMA architectures
 d) Parallel Gaussian Elimination method
 e) Bernstein's conditions.

