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CS/B.Tech(CSE)/SEM-7/CS-704C/2010-11 2010-11

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.

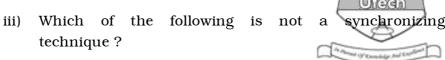
GROUP - A

(Multiple Choice Type Questions)

- 1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) Amdahl's law is about
 - a) lower limit on speed up
 - b) upper limit on speed up
 - c) uncertainty limit on speed up
 - d) none of these.
 - ii) Super computer can solve
 - a) all high computation problems in a very high speed
 - b) all NP complete problems in polynomial time
 - c) all NP hard problems in polynomial time
 - d) all of these.

7403 [Turn over

CS/B.Tech(CSE)/SEM-7/CS-704C/2010-11



- a) Barrier
- b) Exclude directive
- c) Spin lock
- d) Critical directive.
- iv) Which of the following is a language that supports parallel programming?
 - a) C++

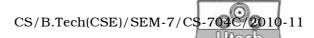
b) C#

c) C*

- d) None of these.
- v) Most effective Gaussian elimination algorithm can be computed in a SIMD machine with n processing element in time complexity.
 - a) $O(n^3)$
- b) O $(n^2 \log n)$
- c) O(n^2)
- d) O $(n \log n)$.
- vi) Matrix multiplication in hyper cube network takes time of
 - a) O(n^2)
- b) $O(n \log n)$

c) O(n)

- d) $O(\log n)$.
- vii) Pipelining is an example of
 - a) data parallelism
- b) fixed stage parallelism
- c) control parallelism
- d) no parallelism.
- viii) Which of the following is true data dependency?
 - a) Loop carried dependency
 - b) Forward dependency
 - c) Backward dependency
 - d) All of these.



- ix) Which of the following is a cost optimal algorithmn
 - a) Biotonic sort in *n* processor
 - b) Matrix multiplication in hypercube
 - c) Matrix multiplication in 2d mesh
 - d) None of these.
- x) Which of the PRAM algorithm can be modified to traverse a tree?
 - a) Sum

- b) Vector multiplication
- c) Suffix sum
- d) Prefix sum.

GROUP - B

(Short Answer Type Questions)

Answer any three of the following.

 $3 \times 5 = 15$

- 2. Explain block matrix multiplication with an example.
- 3. What is cost of an algorithm? State Brent's law.
- 4. What is loop carried dependency? Explain with example.
- 5. Compare data parallelism and pipelining.
- 6. Explain the cache coherence problem.

GROUP – C (Long Answer Type Questions)

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

7. Write a PRAM algorithm to solve the graph colouring problem. Explain with an example.

7403 3 [Turn over

CS/B.Tech(CSE)/SEM-7/CS-704C/2010-11

- 8. Write a parallel algorithm to solve Gaussian elimination. Calculate time complexity, speed up and the cost of the algorithm. 9+6
- 9. Draw and describe the hypertree structure for SIMD interconnection network. What is degree and bisection width of this network?

What is a better interconnection network in respect of degree, diameter and bisection width? Explain. 5 + 4 + 6

- 10. Write a parallel algorithm to sort an array using odd even transposition sort. Explain with example. What kind of interconnection network would give you best result for this algorithm? 7 + 7 + 1
- 11. Write short notes on any *three* of the following : 3×5
 - a) Load balancing
 - b) PRAM computational model
 - c) Barrier synchronization
 - d) Data flow dependency
 - e) Fortran 90.

7403 4