53 (CS 714) PLCP

2019

PARALLEL COMPUTING

Paper : CS 714

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. 10+10=20

(a) Discuss *at least five* areas where parallel computing can significantly improve performance.

(b) With an example, differentiate parallelism with pipelining.

2. 10+5+5=20

(a) Design a PRAM model for parallel computation.

Contd.

(b) What are the different types of PRAM model ?

(c) Write a PRAM algorithm for adding 5 with all the numbers present in an array.

if A

5	9	13	1	−4

then your algorithm should produce the following —

10	14	18	6	1

3. 10+5+5=20

(a) Write a list ranking PRAM algorithm.

(b) Apply your logarithm on the following array —

3	9	1	4	7	6	2	11

(c) Compute the time complexity of your algorithm.

4. 10+10=20

(a) Write a PRAM algorithm to multiply two $n \times n$ matrices, where $n = 2^m$.

(b) Assume the following and show the CPU allocation —

$$A = \begin{vmatrix} 3 & 9 & 1 & 4 \\ 2 & 1 & 6 & 3 \\ 1 & 1 & 1 & 1 \\ 0 & 0 & 3 & 2 \end{vmatrix} \qquad B = \begin{vmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 3 \end{vmatrix}$$

5. With proper diagram, discuss the following network and compute their diameter : 5×4=20

(a) Binary tree

(b) 2D Mesh

(c) Butterfly

(d) Pyramid.

6. 5+5+10=20

(a) Prove that a complete binary tree cannot be embedded in a 2D mesh without increasing the dilation beyond 1 if the height of the tree is greater than four.

(b) Prove that a binomial tree of height > 4 cannot be embedded in a 2D Mesh.

(c) With an example, discuss the different load balancing algorithms.

7. Write short notes on : 5×4=20

(a) Bitonic Sequence

(b) Amdahl's Law

(c) SIMD Processors

(d) Shuffle exchange network.