Total number of printed pages–4

53 (CS 714) PRCO

2021

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. *(a)* With a real life problem, discuss how parallel computing can help us. Do you agree that the problem cannot be solved using sequential approach ? Discuss.

   (b) With an example, discuss Amdahl's law.

   10+10=20

2. *(a)* Write a PRAM algorithm to insert a single element into a sorted array.

   (b) Compute the complexity of your algorithm.

53 (CS 714) PRCO/G   2   *Contd.*

(c) Apply your algorithm on the following—

Array = | 7 | 9 | 13 | 21 | 51 | 57 | 91 | 98 |

element to be inserted = 25.

10+5+5=20

3. *(a)* Compute the number of comparisons required to merge two sorted array (each of size $n/2$) into a single sorted array using linear approach.

(b) Write a PRAM algorithm for performing the above task.

(c) Apply your algorithm on

| 23 | 27 | 33 | 44 | and | 11 | 24 | 39 | 57 |

5+10+5=20

4. *(a)* Write a sequential algorithm to compute the multiplication of two 2D arrays, each of which has a size of $n \times n$. Compute the complexity of your algorithm.

(b) Write a PRAM algorithm to perform the above task. Compute the complexity of your algorithm.

(c) Apply your algorithm (PRAM) on the following :

$$A = \begin{bmatrix} 7 & 3 & 1 \\ 1 & 1 & 1 \\ 2 & 1 & 3 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 5 \\ 1 & 1 & 1 \end{bmatrix}$$

5+10+5=20

5. (a) Define the terms — diameter and bisection width, load, embedding.

(b) Compute the diameter and bisection width of —

(i) 2D mesh

(ii) binary tree

(iii) 3D cube

(c) Is it possible to embed a 2D mesh network of size 7×5 to an another network of size 6×10 ? Justify.

8+6+6=20

6. (a) With a diagram, discuss shuffle exchange network.

(b) Among the different load balancing algorithms, which one is better and why ?

10+10=20

53 (CS 714) PRCO/G 3 Contd.

7. *(a)* What is bitonic sequence ? Discuss with an example.

(b) Perform bitonic merge sort of the following :

12	3	9	8	1	7	5	21

5+15=20

_____