53 (CS 714) PRCO

2017

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)* Discuss about the Amdahl's law.

   (b) Consider an algorithm whose 80% operations must be executed sequentially. If the number of processors are 100, compute the maximum speedup.

   (c) With a diagram discuss about the PRAM model of parallel computation. 5+5+10

2. *(a)* Write a PRAM algorithm to add two $n \times n$ matrices, where $n = 2^k$.

(b) Apply your algorithm on the following two metrices A and B.

$$A=\begin{bmatrix} 5 & 4 & 3 & 2 \\ 1 & 5 & 7 & 9 \\ 2 & 2 & 1 & 10 \\ 3 & 4 & 6 & 1 \end{bmatrix}$$

$$B=\begin{bmatrix} 11 & 1 & 7 & 3 \\ 2 & 6 & 8 & 9 \\ 9 & 5 & 3 & 1 \\ 7 & 4 & 6 & 2 \end{bmatrix}$$

10+10

3. (a) Write a PRAM algorithm to merge two sorted arrays, one sorted in ascending order, another sorted in descending order, to a single ascending order sorted array.

(b) Apply your algorithm on the following :

11	33	55

66	44	22

10+10

4. (a) With diagrams derive the diameter and bisection width of the following networks

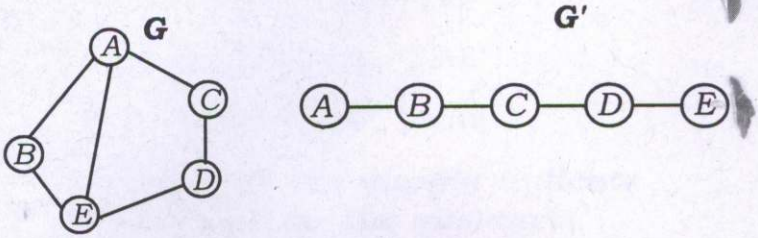
(i) binary tree

(ii) n-dimensional hyper cube

(iii) butterfly network.

(b) "Low diameter and high bisection width are the choice of designers"— Justify the statement. 5×3+5

5. (a) Consider the graph G', which is the embedding of graph G. Compute the dialation.



(b) Prove that $2^{k+1} - 1 > 2k^2 + 2k + 1$ for all $k > 4$.

(c) Embed a complete binary tree of 31 nodes in a 2D-mesh, or prove no such embedding exists. 5+5+10

6. (a) What is bitonic sequence ? Discuss with example.

(b) Perform bitonic merge sort on the following :

7	9	2	1	4	5	13	11

10+10