M.Sc. Semester-IV Examination 2017
Computer Science
Course : MCSC-43
(Parallel Algorithms)

Time : 3 Hours **Full Marks : 40**

Questions are of value as indicated in the margin

Attempt Question No.**1** and **any four** from the rest

1. (a) State and prove Brent's Lemma.
   (b) Present the principle of designing an efficient parallel algorithm for the post order traversal of a binary tree.
   (c) Gievn a shuffle-exchange network of 2^k nodes, under what circumstances node i and j are at a distance of 2k-1? (1+2)+3+2=8
2. (a) Present an 0(logn) time parallel algorithm to multiply two square matrices on a PRAM.
   (b) Discuss the type of concurrent memory access required by the parallel algorithm.
   (c) Also discuss about the time, processors complexities of the algorithm. 5+1+(1+1)=8
3. (a) Present an asynchonous parallel algorithm on a ring of processors for the multiplication of a matrix with a suitable vector.
   (b) Present an analysis of the time compliexity of the algorithm. 5+3=8
4. (a) Define the prefix sum problem.
   (b) Present a logarithmic time non-recursive parallel algorithm to solve the prefix sum problem.
   (c) Discuss about the optimal implementation of the algorithm. 1+5+2=8
5. (a) Use the symmetry breaking technique to design a near optimal fast parallel algorithm for 3-coloring a cycle on a PRAM.
   (b) Prove the Correctness of the algorithm. 5+3=8
6. (a) Show how the following 8 integers can be sorted by Batcher's Bitonic Mergesort algorithm.

   7, 9, 10, 2, 3, 6, 16, 1
   (b) Obtain the time and the processors complexities of Batcher's Bitonic Mergesort. 5+3=8
7. (a) Present the Hirschberg's algorithm for computing the connected components of a graph in parallel on a PRAM.
   (b) Prove the correctness of the algorithm.
   (c) Also obtain the time and processors complexity of the algorithm. 4+2+2=8
