M.Sc. Examination, 2019
Semester-IV
Computer Science
Course : MCSC-43
(Parallel Algorithms)

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

Questions are of value as indicated in the margin

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

1. a) Define speedup, efficiency, cost, and optimality of a parallel algorithm.
   b) Discuss in details the PRAM model of computation and its variations with respect to read and write access. 4+4=8
2. a) Present an asynchronous parallel algorithm to multiply a matrix $A = (a_{ij})_{n\times n}$ and a column vector $x = [x_1, x_2, \ldots x_n]$ on a ring of p processors.
   b) Derive the time complexity of the parallel algorithm.
   c) Also obtain the value of p for which the time required becomes minimum. 4+2+2=8
3. a) Present a parallel algorithm to multiply two square matrices of size n×n on a hypercube of n^3 processors.
   b) Derive the time complexity of the parallel algorithm. 6+2=8
4. a) Define the prefix sum problem.
   b) Present a recursive parallel algorithm to solve the problem on a PRAM.
   c) Obtain the time complexity of the algorithm.
   d) What sort of memory access is performed by the algorithm. 1+4+1+2=8
5. a) Present a parallel algorithm on a PRAM to obtain the convex hull of n points in a plain.
   b) Obtain the time complexity of the parallel algorithm.
   c) What sort of memory access is required by the algorithm. 5+2+1=8
6. a) Present on 0(log log n) time parallel algorithm to compute the maximum of n elements on a PRAM.
   b) Prove that the algorithm takes 0(log log n) time. 3+5=8
7. a) Define a bitonic sequence.
   b) Explain, using the diagram of bitonic sort, how the numbers 7, 6, 1, 5, 8, 2, 4, 3 can be sorted.
   c) How many comparators are required to sort 64 elements using bitonic sort algorithm. 1+4+3=8

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