B. Tech.

(SEM. VIII) EXAMINATION. 2006-07

PARALLEL ALGORITHMS

Time : 3 Hours] [Total Marks : 100

Note : (1) Attempt all questions.
       (2) All questions carry equal marks.
       (3) Be precise in your answers.

1 Attempt any two parts : 10x2=20

(a) Define the following:-
   (i) Contrasting pipelining and data parallelism
   (ii) Scalability.

(b) Given a set of n values a_1, a_2,...... a_n and an associative operation (f) the prefix sum problem is to compute the n quantities.

   a_1
   a_1 + a_2
   a_1 + a_2 + a_3
   \vdots
   a_1 + a_2 + a_3 + \ldots + a_n

   Give an parallel algorithm to find prefix sums of n-element using n-1 processors on PRAM model.

V-1049] 1 [Contd...
(c) (i) Describe the models of computation in brief.
(ii) Given A, a parallel algorithm with computation time t, if parallel algorithm A performs in computational operations, then P processors can execute algorithm A in time t+(m-t)/p.

2 Answer any two parts: 10x2=20
(a) Explain odd-even transposition sort. Do you think it is accurate to describe odd-even transposition sort as a parallel bubble sort? Give your views.
(b) Which of the following sequences are bitonic sequences:
   (i) 8,4,2,1,2,5,7,9
   (ii) 1,9,7,3,2,5
   (iii) 1,3,6,4,7,9
   (iv) 3,3,4,5,2
   (v) 6,2,6,9,7.
(c) Describe multiprocessor oriented parallel quicks short algorithm, with an example.

3 Answer any two parts: 10x2=20
(a) Describe branch and bound algorithm by taking a suitable example. Describe anomalies in parallel branch and bound.
(b) Define the following in brief:
   (i) Distributed tree search for parallel alpha-beta search
   (ii) Sequential alpha-beta search.

V-1049] 2 [Contd...
(c) Use the minimax algorithm to evaluate the following game tree:

![Game Tree Diagram]

Fig. 1

4 Answer any two parts: 10×2=20

(a) Explain the algorithm for matrix multiplication on the hypercube $IMD$ model, with suitable example.

(b) Explain the row-column-oriented algorithm for matrix multiplication for multicomputers.

(c) Suppose that two $n \times n$ matrices $A$ and $B$ are to be multiplied, and assume that every element of $A$ and $B$ is stored exactly once and that no processing element contains more than one element of either matrix. If we ignore any data broadcasting facility, multiplying $A$ and $B$ to produce the $n \times n$ matrix $C$ requires at least $S$ data routing steps, where $\sigma(2s) \geq n^2$. [Given a data item originally available at a single processor in some model of parallel computation, let the function $\sigma(k)$, be the maximum number of processors to which the data can be transmitted in $K$ or fewer data routing steps.]

V-1049] 3 [Contd..
5. Attempt any two parts:
(a) Given $p \geq 2$ processors, an upper bound on the number of active operations required by $P$-depth search on the CREW (Concurrent read exclusive write) PRAM model is

$$\sum_{i=1}^{n} \frac{d_i + 1}{p} \lceil \log_p \lceil \log p \rceil + 1 \rceil$$

$D_i \rightarrow \text{denotes the degree of vertex } i$

(b) Define the connected components of an undirected graph. Explain the Hirschberg’s connected component algorithm with the suitable example.

(c) Discuss the parallel algorithm based on Kruskal’s algorithm for minimum cost spanning tree.