NAME:_____Student Number:_____

CSE4/529 **MidTerm I** Fall, 2013

This exam is *closed book/notes/neighbors/etc.* Answer all questions on these exam pages. No code or pseudo-code is necessary – just a precise and concise explanation and justification. *Unsupported work will receive no credit.*

Q1 of 4 (8 pts) Draw and label a hypercube of size 8.

NAME:_____

Q2 of 4 (6 pts) Fill in the following table using Θ notation. While no explanation is required, if you feel it necessary to include an explanation or comment, please provide such information in the space provided below the table.

Model [1] *n* processors [2] *n* base processors	Communication Diameter	Bisection Width	Degree of Network
[1] Mesh			
[2] Pyramid			
[2] Mesh-of-Trees			
[1] Hypercube			

NAME:_____

Q3 of 4 (8 pts) Give an algorithm for a linear array that is asymptotically cost-optimal to compute the global OR of n Boolean data items equally distributed amongst the processors. (Note that each data item is either a 0 or a 1.) Further, your algorithm should be time-optimal over all such cost-optimal algorithm/architecture pairs.

State and justify (2 pts each)

a. the number of processors you have chosen for the linear array,
b. the asymptotic number of memory locations per processor in your linear array,
c. the asymptotic running time of your algorithm, and
d. the asymptotic cost of your algorithm.

NAME:_____

Q4 of 4 (8 pts) Give an asymptotically optimal algorithm to determine the global OR of a set of n Boolean data items on a PRAM of size n. Initially, there exists 1 data item (a zero or a one) in each of the first n memory locations. When complete, the OR of these n Boolean values should be in memory location $n + 1$. State and justify the asymptotic running time of your algorithm and asymptotic cost of your algorithm.

a. Algorithm (4 pts)
b. Asymptotic Running Time of Your Algorithm (2 pts)
c. Asymptotic Cost of Your Algorithm (2 pts)