NAME:_________________________Student Number:__________________

CSE4/529 **MidTerm I** Fall, 2014

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 5 (8 pts) Prove that $\sum_{k=1}^{n} k^{1/4} = \Theta(n^{5/4})$ .

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Q2 of 5 (4 pts) Discuss the advantages and disadvantages of a linear array of size $n$ as compared to a hypercube of size $n$. Be very clear and concise.

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Q3 of 5 (4 pts)  Draw a mesh-of-trees of base size 16.

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Q4 of 5 (8 pts) Give an asymptotically optimal algorithm to sum a set of $n$ values on a PRAM of size $n$. Initially, there exists one such value in each of the first $n$ memory locations. When complete, the sum of these 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)

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Q5 of 5 (6 pts) Draw an optimal combinational circuit to determine the minimum of 8 input items.