CS4/531 **Midterm Exam** Winter, 1997

This exam is *closed book/notes/neighbors/etc.* Answer all questions. *Unsupported work will receive no credit.*

1. (40%) Given a set of n **integer** values in the range of [1,100], for each of the following architectures, give an efficient algorithm to sort these data items. Discuss the quality of each of your solutions in terms of time/space/processors.
   a) RAM
   b) PRAM
   c) Mesh
2. (40%) Assume that n student records of the form (x,y), where x is the semester of a student with a GPA of y, are given **initially ordered** by x (semester). For each of the following architectures, give an efficient algorithm to determine the average GPA over all students in the same semester (i.e., identical value of x), for every value of x. Discuss the quality of each of your solutions in terms of time/space/processors.
   a) RAM
   b) PRAM
   c) Mesh
3. (20%) Hypercube question:
   a) Define a hypercube of size n.
   b) Draw a hypercube of size 16. Label the nodes.
   c) What is the communication diameter of a hypercube of size n. Justify.
   d) What is the bisection width of a hypercube of size n. Justify.