CS531 **Midterm Exam** Winter, 1998

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

1. (25%) Given a list $S = \langle s_1, \ldots, s_n \rangle$ of *n* integers, and a search key *k*, determine the number of occurrences of *k* in *S*. Discuss the quality of each of your solutions in terms of time/space/processors. Efficiency counts.
   a) RAM
   b) CREW PRAM
   c) CRCW PRAM
   d) Linear array
2. (35%) Given a list $S = \langle s_1, \ldots, s_n \rangle$ of *n* integers, and a search key *k*, create a list of members of *S* arranged so that all of the search keys appear before all of the other keys. Discuss the quality of each of your solutions in terms of time/space/processors. Efficiency counts.
   a) RAM
   b) CREW PRAM
   c) CRCW PRAM
   d) Linear array
   e) 2-D Mesh
3. (40%) Given a set $X = \{x_1, \ldots, x_n\}$ of integers, $x_i \in [1, n^{1/2}]$, distributed in an arbitrary fashion one element per processor on a 2-D mesh of size *n*, give an optimal algorithm to sort *X*. Given a 2-D mesh of size $n^{2/3}$, give an optimal algorithm to solve this problem.