CS5351.501/502, Summer I, 2009
Parallel Processing
Assignment 1

Issued: 6/15/2009
Due: 6/22/2009

1. (25 pts) Give tight big-oh and big-omega bounds on $T(n)$ defined by the following recurrences. Assume that $T(1) = c$, where $c > 0$ is some constant.

(a) $T(n) = T(n/2) + 2 \lg n$
(b) $T(n) = 4T(n/4) + C$
(c) $T(n) = (2/3)T(n/2) + n$

2. (25 pts) In class we analyzed the control-parallel algorithm of the Sieve of Eratosthenes (page 10-13 of the textbook). In particular Figure 1-9 illustrated the limitations of the algorithm. Is there any other limitation other than the one pointed out by the textbook? Describe in details whatever you find.

3. (25 pts) The data-parallel algorithm of the Sieve of Eratosthenes, it assumed that Processor 1 will transmit the next prime prime to be used for strike-out sequentially to every other $p - 1$ processors. Therefore the communication cost could be a significant portion of the total cost. Now assume that Processor 1 can *broadcast* the next prime number to every other processors. How will this new way of communication affect the total cost? Please do some analysis similar to those presented in the textbook.

4. (25 pts) Devise an CREW PRAM algorithm to find a minimum spanning tree of a connected undirectional weighted graph with n nodes. For full credit, your algorithm should be as efficient as possible. Analyze the time complexity of your algorithm.