

**CS 182**

Advanced Topics in Algorithms

Spring 2003

Problem Set 7a

Due Thursday, March 6 in class

1. **[25 Points] Tally Circuits!** A tally circuit has  $n$  binary inputs and  $\lceil \log_2(n + 1) \rceil$  outputs. Interpreted as a binary number, the outputs give the number of 1's in the input. For example, if the input is 1101111 then the output is 110, indicating that there are six 1's in the input. Describe a tally circuit with depth  $O(\log n)$  and size  $O(n)$ . Show your analyses. (Careful here – achieving the depth and size requirements will require some care.)