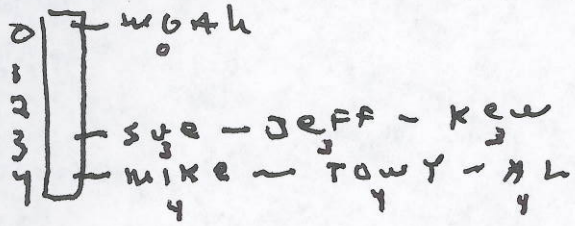
95-771 Data Structures and Algorithms
Fall 2010

Midterm Exam

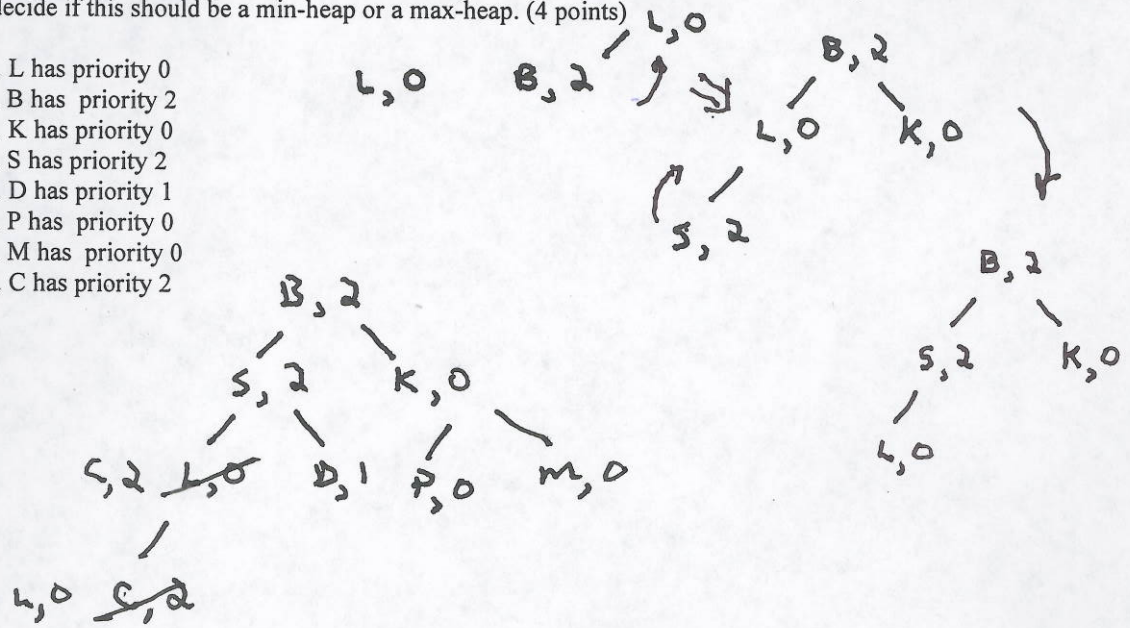
Priority Queues: (15 points)

2) (a) Sue has implemented a priority queue as an array of linked lists. Each list has an enQueue and deQueue method and these methods run in θ(1). The enQueue method adds data at the rear of the queue and the deQueue method removes data from the front of the queue. Each array cell holds a pointer to the front of the queue and a pointer to the rear of the queue. There are 5 priorities and so the array has 5 elements. The highest priority is 0 and the lowest is 4. Draw a picture of this data structure after the following data (with priorities shown) has been entered: Mike 4, Sue 3, Tony 4, Jeff 3, Al 4, Ken 3, Noah 0. (5 Points)



(b) Bill has implemented a priority queue as a heap in an array. Draw a picture of the heap as a tree as it is being built. There are 3 priorities. The highest priority (those chosen first) is 2 and the lowest priority is 0. Show each node being entered by redrawing the entire tree after each of the following insertions. You need to decide if this should be a min-heap or a max-heap. (4 points)

Ms. L has priority 0
Mr. B has priority 2
Ms. K has priority 0
Mr. S has priority 2
Ms. D has priority 1
Mr. P has priority 0
Mr. M has priority 0
Ms. C has priority 2



(c) In Bill's priority queue, what is the worse case runtime complexity (Big Theta) of the delete operation ? (3 points) Θ(Log N)

(d) In Sue's priority queue, what is the worse case runtime complexity (Big Theta) of the delete operation.(3 Points)
Θ(1)