Homework 4 (Cpt S 223)
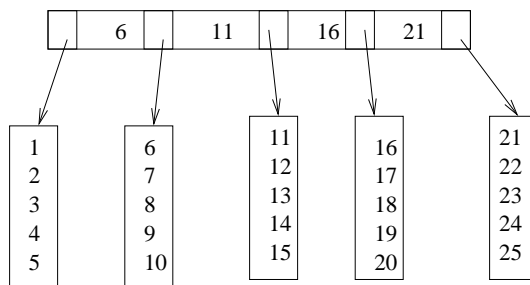
Due Date: November 3, 2010

Total points: 48

For all questions that ask you to draw binary heaps, use the tree representation to show your answers (not array). Also, use a MinHeap unless otherwise specified.

1. (5 points) Insert 26 into the following B+ tree:

M=5, L=5

| | 6 | | 11 | | 16 | | 21 | |

| 1 2 3 4 5 | | 6 7 8 9 10 | | 11 12 13 14 15 | | 16 17 18 19 20 | | 21 22 23 24 25 |

2. (5 points)

Calculate the parameters M and L for a B+tree that meets the following specifications: Each data record in the array is 64 bytes. The search key occupies 16 bytes. Each disk block is 4 KB (=4,096 bytes). Assume 32-bit CPU architecture (i.e., pointers cost 4 bytes each).

3. (5 points) Draw the tree representation for the following binary heap array representation:

| 2 | 3 | 4 | 9 | 13 | 17 | 15 | 11 | 9 | 10 | 22 | 20 |

Is this a valid binary heap? If not, what will you do to fix it?

4. (7 points) Starting with an empty binary heap, insert the following sequence of elements into it: 10, 5, 2, 3, 7, 8, 1. Your answer should show the resulting binary heap after each successive insertion. However, there is no need to show the the intermediate trees *within* an insertion step.

5. (7 points) Now use the buildHeap() procedure to insert the set of elements {10, 5, 2, 3, 7, 8, 1}. Your answer should follow the algorithm in slide 38 of the lecture notes on priority

queues. Also report the total number of swap operations you had to perform overall all the iterations.

6. (5 points) Show the resulting binary heap after performing DeleteMin:
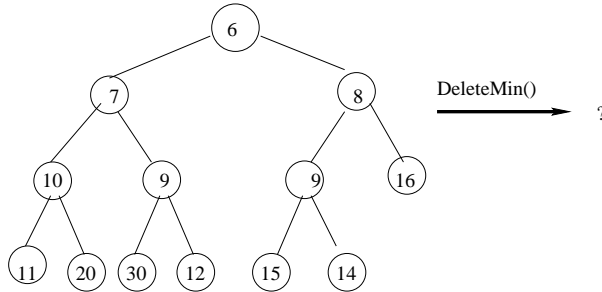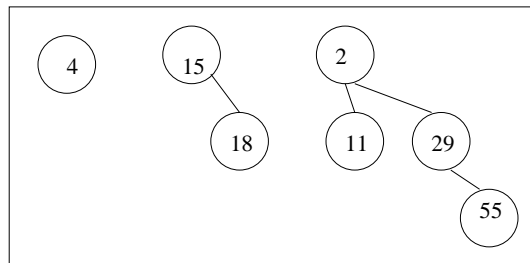

7. (8 points) Perform the following two operations on the binomial heap, each independently on the input heap:
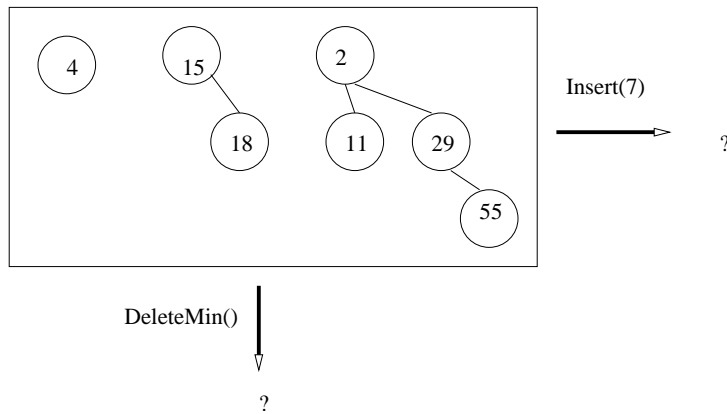
8. (6 points) Merge the following two binomial heaps:

H_1: H_2: