Week 5 (Q7-Q9):

Q7 Given an array with content (of type date): 1 Jul, 30 Jan, 22 Mar, 22 Dec, 30 May, 21 Feb, 3 Nov, 7 Jun, 22 Feb, 21 Nov, 30 Dec; all of the same year. Suppose an earlier date is considered bigger than a later date; for example, "30 Jan is bigger than "30 Dec. In order to sort these dates by Heap Sort, let us construct a maximizing heap. Show the content of the array after the heap construction phase.

Q8 An array of distinct keys in decreasing order is to be sorted (into increasing order) by Heap Sort.

(a) How many comparisons of keys are done in the heap construction phase (Algorithm constructHeap() in lecture notes on Sorting) if there are 10 elements?

(b) How many are done if there are n elements? Show how you derive your answer.

(c) Is an array in decreasing order the best case, the worst case, or an intermediate case for this algorithm? Justify your answer.

Q9 Given k lists with a total of n numbers, where $k \geq 2$ and each list has been sorted in decreasing order, design an algorithm to merge the k lists into one list sorted in decreasing order, in running time $\mathcal{O}(n \log_2 k)$.