

2003 Paper 3 Question 3

Data Structures and Algorithms

- (a) In the first phase of heapsort, an initially random vector is rearranged to satisfy the heap structure constraints. Describe what these are, how the rearrangement is done, and prove that it can be done in $O(n)$ time, where n is the number of elements in the vector. [7 marks]
- (b) Complete the description of heapsort and show that its worst case performance is $O(n \log n)$. [7 marks]
- (c) How many element comparisons would your implementation use to sort the integers 1 to 8 if they were (i) initially in sorted order, and (ii) initially in reverse sorted order? Explain how you obtained your answers. [6 marks]