Practical Exercise 10 – Sorting

Part 1 – Discussion

1. Given the following array:

   44 78 22 7 38 56 34 2 98 35 45

   Assume that the items in the array need to be sorted into ascending order. Step through the sort process manually and show the contents of the array at each step of the sort. Use and compare the following sort methods:

   i. Bubble sort
   ii. Selection sort
   iii. Insertion sort
   iv. Merge sort
   v. Quick sort

2. Show the heaps when inserting each of these keys in this order: 44, 66, 33, 88, 77, 55, 22. Also, show the heaps when retrieving each of the keys.

3. Discuss the efficiency of each of the sorting methods listed above in terms of its complexity by using the Big-O notation.

Part 2 – Programming Exercise

Question 1

Define a test program that puts 20 random integers between 0 and 100 into an array. The program should print out a random array of integers of size 20.

[Note that in Java, there is a method `Math.random()`, which returns a double value between 0.0 and 1.0. And there is another method `Random.nextInt(int n)`, which returns a random value in the range of 0 (inclusive) and n (exclusive).]

Question 2

In addition to the test program you have constructed for Question 1, write the program segment which sorts the random array of integers into increasing order of integers using ***quick sort*** or ***merge sort***.