COMP 3761 Assignment 2

Due Date: Friday **August 7 2009** at 6:30pm in class **SE12-321**

Instructions:

- No late assignments will be accepted.
- This is an individual assignment. You are welcome to discuss the assignment with others, but you **must** submit your own solutions.
- **Cheating**, as outlined in BCIT Policy 5002, is not allowed. Copying solutions from or to others will result in **zero** for the entire assignment for all involved individuals.
- For the programming parts, please submit your source codes into the BCIT SHARE IN under COMP3761 A2 folder. In addition, please print out your source codes, and submit a hardcopy of the source code together with your test results.
- For all written questions, ensure to show your steps to support your answers.

1. Implement the following sorting algorithms in Java:

   (a) Mergesort

   (b) Quicksort

   (c) Heapsort.

   Investigate the performance of these algorithms on arrays of sizes $n = 10^2, 10^3, 10^4, 10^5$. For each of these sizes, consider the following:

   (a) randomly generated integers in the range of $[1..n]$

   (b) increasing order of integers $1, 2, \ldots, n$

(c) decreasing order of integers $n, n-1, \ldots, 1$.

Summarize your test results and comment on the time efficiency of these algorithms. Submit your source codes and test results. [30 marks]

2. Write a program that, given a graph, outputs

   (a) its minimum spanning tree

   (b) the shortest paths from an arbitrary source vertex to all other vertices in the graph.

   For part (2a), you may choose to implement either Prim's algorithm or Kruskal's algorithm. Hand in your source codes and test results. Be sure to include your input graphs and the corresponding outputs. Note: No GUI implementation is required for this problem. You may simply input graphs by using the matrix representations. [10 marks]

3. Text Page 187 Exercises 5.5 #3. [10 marks]

4. Text Page 202 Exercises 6.1 #3. [10 marks]

5. Text Page 230 Exercises 6.4 #5. [10 marks]

6. Text Page 303 Exercises 8.4 #2. [10 marks]

7. Text Page 304 Exercises 8.4 #9. [10 marks]

8. Text Page 313 Exercises 9.1 #2. [5 marks]

9. Text Page 313 Exercises 9.1 #3. [5 marks]