Q1 – 10 marks Travel across country rental problem

Mostly done – need to record rentals, test with bigger more diverse data sets

Q2 10 marks Traverse using Bellman ford

Mostly done – need to Print shortest path to each node

Q3 20 marks Create a data structure that minimises in memory data

Q4 10 marks Design and implement in C++ a data structure for storing unordered lists of integers that:

a. Can store integers in the range 0 .. n where n is some upper bound.

b. Duplicate integers are not allowed in the list.

c. Is O(1) for add, delete, test for being in the list and iterating through the list.

d. Is O(k) (where k is the number of integers in the list) for clearing the list.

Q5 (15 Marks) A very large number of random numbers are added to a list. Design and implement efficient data structures that will maintain a separate list of the k smallest numbers that are currently in the list. Space efficiency must be O(k + n). How would you handle deletions? Perform an amortised analysis of your data structure.

Q6 (20 Marks) A simple algorithm for maze generation is to start, apart from entry and exit points, with all walls present and randomly knock down walls until the entry and exit points are connected. Write a C++ program to implement this algorithm for an arbitrary sized maze – test with a 50 by 88 rectangular maze.

Q7 (15 Marks) Using C++ software obtained from the internet analyse and compare the performance of Red-Black Trees and Van Emde Boas Trees using a large number of integers. This should be done for add, find, delete and sequential access.