COMP26120   Algorithms and Imperative Programming

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Comments   MDM: I marked Q1 and Q3. In both cases the results were very good, with a small number of exceptions. In Q1 most of the students answered successfully the first two parts of the question (which were basically the bookwork and the lab exercise). A good number of students gave a very good argument for the final part of the question, which was more creative. For Q3 the results were similar. The question consisted of 4 different parts. For the hash table there were a few mistakes, mainly associated with the wrong calculation of the hash function, or not writing how the answer was obtained. In the second part the mistakes were associated either by not properly understanding the rotations in AVL trees and not giving the intermediate steps in the process (rather than the final result only). The complexity part of the question was done correctly by most of the students. In the final part most of the mistakes came from the non-optimal solutions or the wrong way of reattaching the
loose branches in the AVL tree. Overall, the performance was very good and I was quite pleased with the results.

JK: Q2 Knapsack

2a) The question asked about the definition of the fractional knapsack upper bound,how it is calculated, and how it is used in Branch and Bound for the 0/1 problem.

This was answered well by some students, with clear and sufficiently detailed answers often picking up 5 marks out of 6, sometimes 6. A mark was often dropped for missing out the use of the bound to prune the search tree.

Weaker answers failed to identify clearly how to calculate the bound using a version of the greedy approach with items in descending v:w order, and/or gave inadequate detail regarding the bound's use in the branch and bound method.

B) This question was centred around a given problem instance of 0/1 Knapsack, and asked (i) about the optimality of the greedy method on this instance, (ii) how to design a better variant of greedy, and (iii) to comment on the efficiency of dynamic programming on the instance.

There was a lot of variety in the success of students answering this question. Part (i) was answered well by many, but some failed to skip over items when calculating the greedy algorithm's solution. Part (ii) was simply a matter of noticing
that with a slight rearrangement of items (tied for v:w ratio) the greedy algorithm can be made to work better (on this instance). Some students here suggested a much more computationally expensive approach, but still picked up half marks if they showed it working. Part (iii) was answered well by some, but others did not focus on features of the given problem instance and gave too general an answer.

C) The last part asked candidates to explain how the tabular dynamic programming approach to 0/1 knapsack uses the Principle of Optimality to build optimal solutions.

Many picked up 3 or 4 marks out of four for a clear description of the subproblems, and how their solutions are related to each other. Others scored only half marks due to a lack of precision in identifying the subproblems and/or their solutions.

DER: Q4

Though there were some outstanding answers to this question on graph representation and traversal methods, the general standard of answer was not good, including on lectured material. Many students lost marks through unclear explanations, and from the failure to answer the question as printed (for example, you were asked to describe traversal methods for graphs, but many described them only for trees and hence lost marks).

The final part on graph colouring was answered fairly well, though some misinterpreted colouring as not the ability to colour a graph satisfying the condition, but as a property of coloured graphs. DFS could be modified by colouring the nodes alternate colours and checking back edges for a clash of colours.

There were some complaints that the exam paper did not make clear that this final part of the question existed on the last side of the exam paper. I forwarded the complaints to the Head of the Undergraduate School and he looked at the exam paper as it appeared in the exam room, and considered the complaints unjustified. There were two warnings at the bottom of page 5, one in bold, that there was another page of the exam paper, and on this final page was the "End of examination" notice.

30 September 2013