

Due: Wednesday, October 22, noon

This assignment is worth 35% of the final grade. Each question is worth a multiple of 5 points. If you have no idea how to answer a question (or part of a question), you will receive 20% of the credit for that question (or subquestion) by leaving the question (or subquestion) blank. If your answer makes no sense, you will not receive any credit. Any answer that shows some understanding of the question will receive some credit.

NOTE: Some of these questions will not be solved easily. Do NOT worry if you cannot answer every question. Do what you can and manage your time so that the course work for CSC2421 does not impact your other courses(s).

1. Exercise 5 in Chapter 2. [20 points; 5 points for each subquestion]
2. Exercise 7 in Chapter 2. [10 points]
3. Exercise 3 in Chapter 3 [10 [points]
4. This question relates to Section 4.4 in the text. [20 points]
Consider the (unweighted) disjoint paths problem on an N node line graph. But now consider online algorithms with revoking.
 - Show that for input instances where all calls have the same path length, the optimal deterministic competitive ratio is exactly 2 (expressing ratios as being greater than or equal to 1). This requires both a positive and matching negative result. [5 points]
Hint: Use a charging argument for the positive result which does not need revoking.
 - Show that for input instances where calls can have one or two possible path lengths, the deterministic competitive ratio is exactly 4. [10 points]
Hint: For the positive result, we now need revoking. There is a charging argument for the positive result but it is not as direct as for single length instances. The interesting case is how to charge calls that caused a previous call to be revoked.
 - Show that for input instances where calls can have arbitrary path lengths, the deterministic competitive ratio is not constant. [10 points]
5. Prove that there is no fixed or adaptive priority algorithm for the general knapsack problem that can achieve a constant ratio. [10 points]