

Potential Exam Questions

Algorithms and Complexity lecture
Master in Data Sciences & Business Analytics at CentraleSupélec/ESSEC

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Abstract

Below, you find a few questions that shall give you an idea of expected difficulties in the upcoming exam for the lecture “Algorithms and Complexity” in the Master in Data Sciences & Business Analytics at CentraleSupélec/ESSEC. Please note that there is no guarantee that all final questions are related to the ones below or that they will be all of similar difficulty than the questions provided here.

The exam will be a multiple choice test with 3-4 answers for each question. Each question will have at least one correct answer (maybe 2, maybe 3, maybe 4). I plan to have about 25–30 questions in total, ranging from simpler (2 points) to harder questions (10 points). Note that wrong answers will be graded with negative points such that you rather leave a question unanswered if you are not fully sure (more details will be given before the exam).

1 Basics: Combinatorics, O-Notation and Graph Theory

- (2 points) How many different combinations of any five (French) Euro coins can you have in your pocket?
 - 5
 - 120
 - 792
 - 3125
- (2 points) Which of the following statements is correct?
 - $n \log n = O(n \log n)$
 - $2n^2 \cdot \log^2(n) = O(n \log n)$
 - $\frac{n}{\log n} = O(n \log n)$
 - $\frac{\log n}{n} = O(n \log n)$
- (2 points) Which of the following statements about graphs is correct?
 - Each forest is a walk.
 - Each cycle is a trail.
 - Each Hamiltonian cycle is a closed walk.
 - Each closed walk is a Hamiltonian cycle.
- (10 points) The shortest path from node u to node v in the following graph is of which length?
- (2 points) Which of the following operations run in time X on data structure Y ?

2 Greedy Algorithms

- (10 points) For which of the following coin sets does the greedy algorithm compute the optimum for the money change problem of the lecture with a change of $W=37$?
 - 1 cent, 2 cents, 3 cents
 - 1 cent, 5 cents, 15 cents
 - 1 cent, 17 cents, 22 cents
 - 1 cent, 16 cents, 33 cents
- (10 points) What is the cost of a minimal spanning tree problem in the graph below?

3 Dynamic Programming

- (10 points) The shortest path from node u to node v in the following graph is of which length?