

Lecture 33

CSE 331

Nov 20, 2023

Sample final exam

note @503

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Actions

Sample final exam

Since one of you asked for it, I figured I'll release the sample final exam in case it helps you plan better for the final exam:

- [Sample final](#)
- [Sample final solutions](#)

(These are also available under the "Sample Exams" dropdown menu from the banner on the 331 webpage. If you do not see it on your browser, refresh and/or clear the cache in your browser.)

Two comments:

- I would recommend that you not peek at the solution before you have worked on the sample final on your own.
- As with the sample mid-terms, do **not** try and deduce anything about the topic coverage in the actual final exam (I will post shortly on how to prepare for the final exam).
 - However, the sample exam was an actual final exam in one of the past years. Your final exam will be of comparable difficulty.

final

Edit good note | 0

Updated 12 minutes ago by Atri Rudra

Final exam post

note @505

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Final exam post

I'll start off with some generic comments:

- The final exam will be based on all the material we will see in class up to NP-completeness of k-colorability (we'll finish that stuff by either Friday, Dec 8 or Monday, Dec 11).
 - In case you want a head-start we will cover Sections 8.1-8.4 and Section 8.7 in the textbook. For the rest the [schedule page](#) details what sections of the book we have already covered.
 - I know this does not give a huge lead time into the final exam but unfortunately since we are running one lecture behind previous years means less lead time than in previous years.
- Exam will be from **12:00pm to 2:30m** on Wednesday, **Dec 13** in class (**NSC 201**). Note that the exam will be for 2.5 hours and *not 3 hours* as it says on HUB.
 - ~~I will post the makeup final exam time (due to exam conflicts -- see @447) by Monday, Nov 20.~~ If you had emailed me about a conflict with the final exam time (see @447), I have emailed you back the details on the timing of the makeup final exam.
- **DO NOT FORGET TO BRING YOUR UB CARD TO THE EXAM (@504)**

Next are comments related to **preparing for the finals**:

1. Take a look at the sample final (@503) and spend some quality time solving it. Unlike the homeworks, it might be better to try to do this on your own. Unlike the sample mid-term, this one is an actual 331 final exam so in addition to the format, you can also gauge how hard the final exam is going to be (your final exam will be the same ballpark). However as with the sample mid-term, you make deductions about the coverage of topics at your own peril (but see points below). Once you have spent time on it on your own, take a look at the sample final solutions (@503).
2. The actual final will have the same format as the sample final: The first question will be T/F, 2nd will be T/F with justification, the rest of the three will be longer questions and will ask you to design algorithms (parts of them might be just *analyzing* an algorithm.)
3. For the T/F questions (i.e. the first two questions), anything that was covered in class or recitations or piazza is fair game. If you want to refresh your memory on what was covered, take a look at the [schedule page](#). If you want quick summaries of (almost all) the lectures, review the [lecture notes or slides or videos](#).
4. To get more practice for the T/F questions, review all the T/F polls on piazza (@60)
5. For the remaining 3 questions, one will be on greedy algorithms, one will be on divide and conquer algorithms and one will be on dynamic programming. However, note that Chapter 2 and 3 in the book are basic stuff and almost any question in the final could fall under the purview of those two chapters. There will be **at least** one T/F and one T/F with justification Q for the NP-complete material so y'all should definitely focus on those as well but I will not ask any "proof based" Qs on that material.
6. In previous finals, like your mid-terms, there have been questions that are either straight lifts from homeworks or are closely related and this trend will continue in the actual exam (though to a lesser extend then the mid-term). This means that you should review your homeworks (all of them) before the exam. Also make sure to review the [support pages](#) and [recitation notes](#).
7. If you are short on time and you are prioritizing the topics to study, keep points 5 and 6 above in mind.
8. Sections in the book that were not covered at all in the class but were handed out as [reading assignments or recitation notes](#): I can also ask any direct questions from them. In addition, it might be useful to read them to get a better feel for the material. In any case once you have read the material covered in class a couple of times, it might do your brain some good to read some different material.

Bring UB card to final exam!

note @504

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Assigned seating for final exam

Your seating for the final in NSC 201 will be assigned (and you won't be able to sit wherever you find a spot as it was for the mid-term).

I will release more details by Monday, Dec 11. In the meantime, two important things to remember:

- You will **HAVE to have your UB card on you during the exam**
 - A TA will come and verify that you are seated in the correct row
- To facilitate the TAs checking your UB IDs, **please keep your bag in the front of the room** (i.e. not with you).

final

Edit good note | 0

Updated 13 minutes ago by Atri Rudra

Makeup for final exam conflict

note @509    stop following **1 view** Actions ▾

Final exam conflict makeup exam

If you had emailed me about a time conflict with CSE 331 final exam time ([@447](#)), then I have emailed you back with the time and location of the makeup final exam on Dec 12.

If you have not emailed me (the deadline was Friday), then I have assumed that you do not want to do a makeup final exam.

[final](#) [logistics](#)

[Edit](#) [good note](#) | 0 Updated 21 seconds ago by Atri Rudra

Questions?



Subset sum problem

Input: n integers w_1, w_2, \dots, w_n

bound W

Output: subset S of $[n]$ such that

(1) sum of w_i for all i in S is at most W

(2) $w(S)$ is maximized

Recursive formula

$OPT(j, B)$ = max value out of w_1, \dots, w_j with bound B

If $w_j > B$

$$OPT(j, B) = OPT(j-1, B)$$

else

$$OPT(j, B) = \max \{ OPT(j-1, B), w_j + OPT(j-1, B-w_j) \}$$

Questions?



Recursive formula

$OPT(j, B)$ = max value out of w_1, \dots, w_j with bound B

If $w_j > B$

$$OPT(j, B) = OPT(j-1, B)$$

else

j not in OPT

j in OPT

$$OPT(j, B) = \max \{ OPT(j-1, B), w_j + OPT(j-1, B-w_j) \}$$

Can compute final
S with recursion/
backtracking

Knapsack problem

Input: n pairs $(w_1, v_1), (w_2, v_2), \dots, (w_n, v_n)$,

bound W

Output: subset S of $[n]$ such that

(1) sum of w_i for all i in S is at most W

(2) $v(S)$ is maximized

Questions?

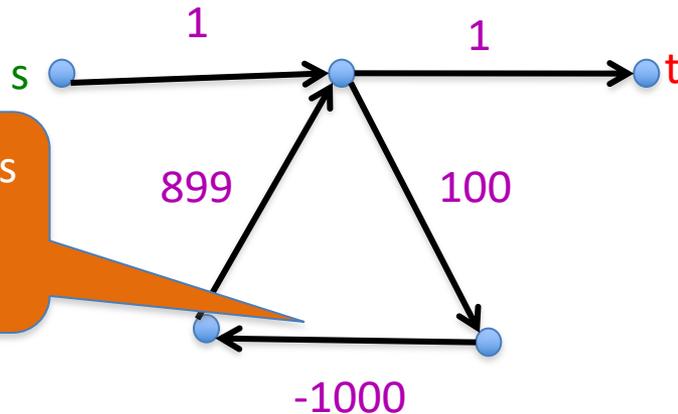


Shortest Path Problem

Input: (Directed) Graph $G=(V,E)$ and for every edge e has a cost c_e (can be <0)

t in V

Output: Shortest path from every s to t

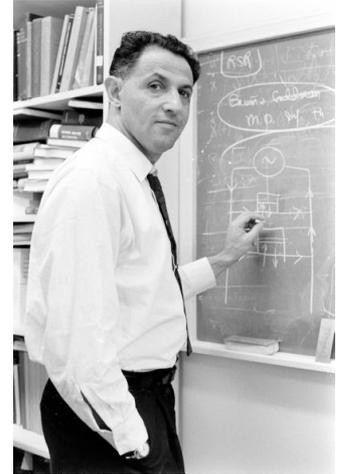


Shortest path has cost negative infinity

Assume that G has no negative cycle

When to use Dynamic Programming

There are polynomially many sub-problems



Richard Bellman

Optimal solution can be computed from solutions to sub-problems

There is an ordering among sub-problem that allows for iterative solution

Rest of today's agenda

Bellman-Ford algorithm