CSE 421 Section 10

Final Review

Announcements & Reminders

- **HW8**
  - Was due yesterday, Wednesday 12/4

- **Final review** with Professor Beame: **Sunday, 12/8 @ TBA on Zoom**
  - He will go over the practice final, so try it before the session if you can

- The **final exam** is on **Monday, 12/9 @ 2:30-4:45 @ CSE2 G20**
  - If you are sick the day of the exam, let us know and we will schedule a makeup

- **Course evaluations** are due **Sunday, 12/8 @ 11:59pm**
  - **Section evaluations** are due **Monday, 12/9 @ 11:59pm**

Final exam format

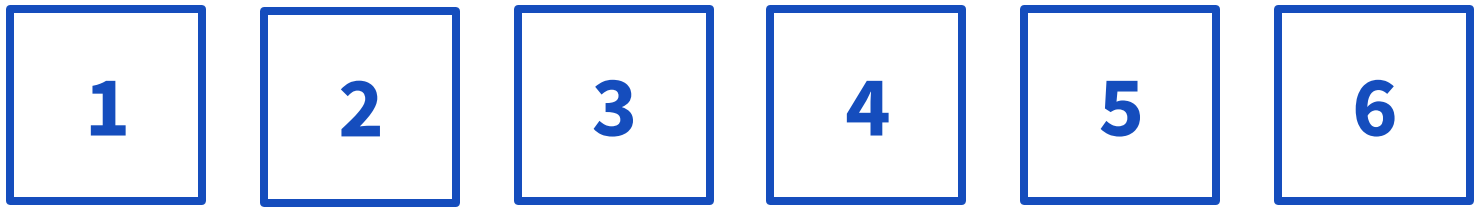
- Similar to midterm exam, but longer
  - A sample final is available on Ed
- 135 minutes
- You will be given a standard reference sheet
  - Is expanded from the midterm, attached to sample final on Ed
- You may bring one sheet of double sided 8.5x11” paper containing your own handwritten notes.
  - Must write name, student number, and UW NetID
  - Must turn in with exam
  - If you want to access your midterm notes sheet, go to Prof. Beame’s OH

Today's plan

1. (35 min) 6 stations around the room with practice problems
   (focused on second half of course, but exam is cumulative)
   - Station 1: Short answer
   - Station 2: Dynamic programming*
   - Station 3: Network flow
   - Station 4: Linear programming*
   - Station 5: Reduction
   - Station 6: Bonus problem
1. (10 min) Go over some of these problems

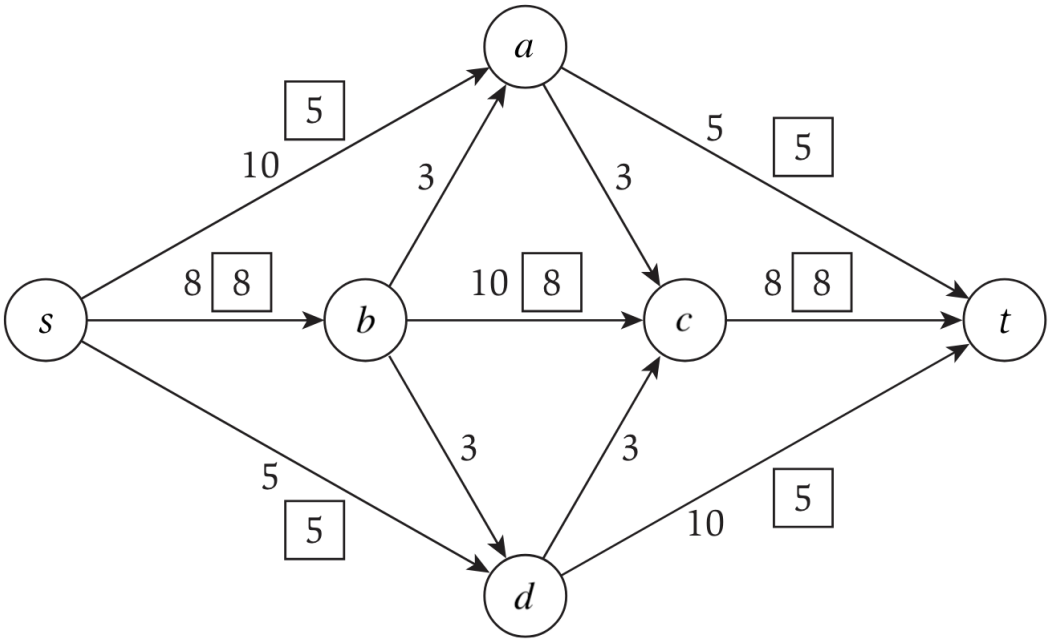
**the problem at this station was an extra problem on a previous section handout*

Problems



Problem 1 – Short answer

In the network flow below, is the depicted flow a maximum flow?



Problem 1 – Short answer

Recall Interval Scheduling: Given a collection of intervals and an integer k, determine if the collection contains at least k nonoverlapping intervals.

i. Does Interval Scheduling $\leq_p$ Vertex Cover?

Problem 1 – Short answer

Recall Interval Scheduling: Given a collection of intervals and an integer k, determine if the collection contains at least k nonoverlapping intervals.

ii. Does Independent Set $\leq_p$ Interval Scheduling ?

Problem 1 – Short answer

A greedy attempt at Set Cover is:

while there exists an uncovered object **do**
choose a set that covers the most number of still-uncovered objects

Suppose you are given an instance where every set contains exactly 2 elements. Then this algorithm returns a set cover that is at most a factor 2 larger than the minimum.

Problem 2 – Dynamic programming

Given two strings, $s = s_1, \dots, s_m$ with length m and $t = t_1, \dots, t_n$ with length n, find the length of their longest common subsequence.

Problem 3 – Network flows

The bank has C_j of currency j, and the exchange rate is R_j of currency j for every 1 Franc. Trader i has T_i Francs to convert and is willing to convert between L_{ij} and H_{ij} of their Francs to currency j. Determine if the bank can satisfy all requests, and if so, how to maximize the amount of Francs it collects.

Problem 4 – Linear programming

There are k groups and m_i voters in group i, of which a_i are already voting for you. If you spend \$1000 advertising issue j, then d_{ij} more voters in group i will vote for you. Determine the minimum spending so that at least half of each group votes for you.

Problem 5 – Reduction

A Hamiltonian path/cycle is a path/cycle that visits every vertex exactly once. Suppose that HamiltonianPath is NP-hard. Show that HamiltonianCycle is NP-hard.

Problem 6 – Bonus problem

In a country with n states and p_i people voting in state i, the winner of state i receives v_i electoral college votes. In a two-candidate election with no state-level ties, determine the minimum percent of the total popular vote necessary to win at least $V = \lfloor (\sum_i v_i)/2 \rfloor + 1$ electoral votes.