Homework 3
CSE 551 Foundations of Algorithms
Spring 2020

April 10, 2020

Submission Instructions: Deadline is 11:59pm on 15^{th} April, 2020. Late submissions will be penalized, therefore please ensure that you submit (file upload is **completed**) before the deadline. Additionally, you can download the submitted file to verify if the file was uploaded correctly. Submit your answers electronically, in a **single PDF**, via Canvas. You can type up the answers or scan (or take pictures) your handwritten answers.

Furthermore, please note that the graders will grade 2 out of the 4 questions randomly. Therefore, if the grader decides to check questions 1 and 4,and you haven't answered question 4, you'll lose points for question 4. Hence, please answer all the questions.

Problem 1:

Given a sequence of key values $[B, F, J, P, V]$, frequencies of successful search $[64, 84, 52, 64, 24]$ and frequencies of unsuccessful search $[0, 68, 76, 116, 190, 42]$, construct an optimal binary search tree (binary search tree of all keys such that the total cost of all the searches is as small as possible). Show all your work.

Problem 2: Analyze Fig. 1 and answer the following:

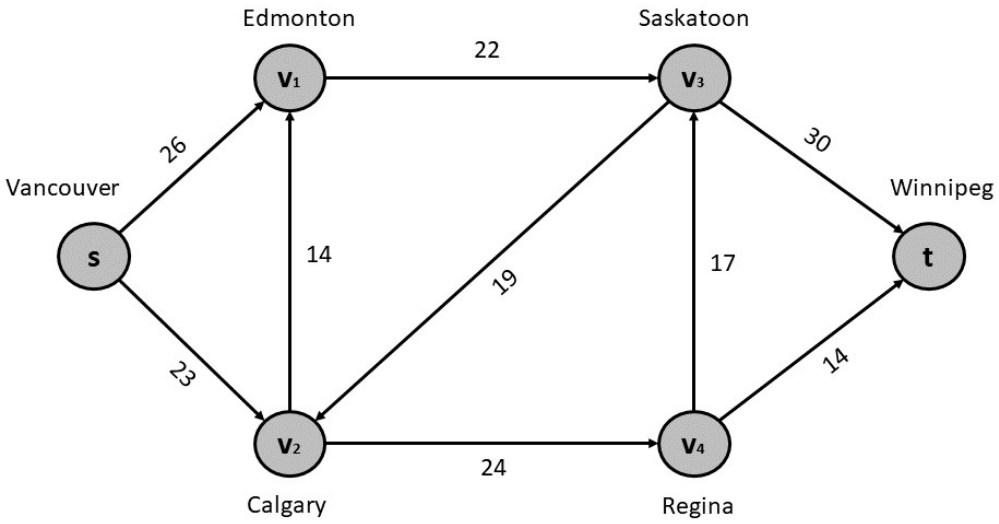

Figure 1: Network for Q1

Compute the Maximum Flow of the network assuming that the source node is Vancouver and the destination node is Winnipeg. **Show all your work.**

Problem 3:

The goal of this exercise is to schedule a tournament consisting of n players. Each player in the tournament *must play exactly once against each of his opponents.* Additionally, each competitor *must play one match everyday, with the possible exception of a single day, where he/she does not play at all.* Provide an algorithm to solve this problem, and show in how many days can the tournament be scheduled, by following your algorithm. Assume that $n = 2^k$.

Problem 4:

Provide an algorithm to solve the above problem, and show in how many days can the tournament be scheduled, by following your algorithm. **Assume that n is odd.**