Assignment #3

(Assignment due: Dec. 06, 2024)

Each question must be completed independently. Any copy of your classmate's work will be considered as plagiarism, which leads to failure of the course.

1.(20) Given five key values k1 < k2 < k3 < k4 < k5 with access probability 0.21, 0.27, 0.18, 0.14, and 0.2, respectively. Apply the algorithm for building an optimal binary search tree to these five keys. Give the working process.

2.(20) When we delete a node *x* from a binary search tree, we will swap it with its successor if *x* has two children. It is a good idea to interleavingly swap *x*'s successor and *x*'s predecessor for two consecutive deletions to avoid lopsided trees. Please give an algorithm to delete a node *x* from a binary search tree, but swap *x* with its predecessor if it has two children.

3.(5) Explain why a red-black tree with n internal nodes has height at most $2\lg(n + 1)$.

4.(15) In the algorithm RB-Delete-Fixup(T, x), complete the treatment of the case that x is a right child (i.e., $x = right[p[x]]$.)

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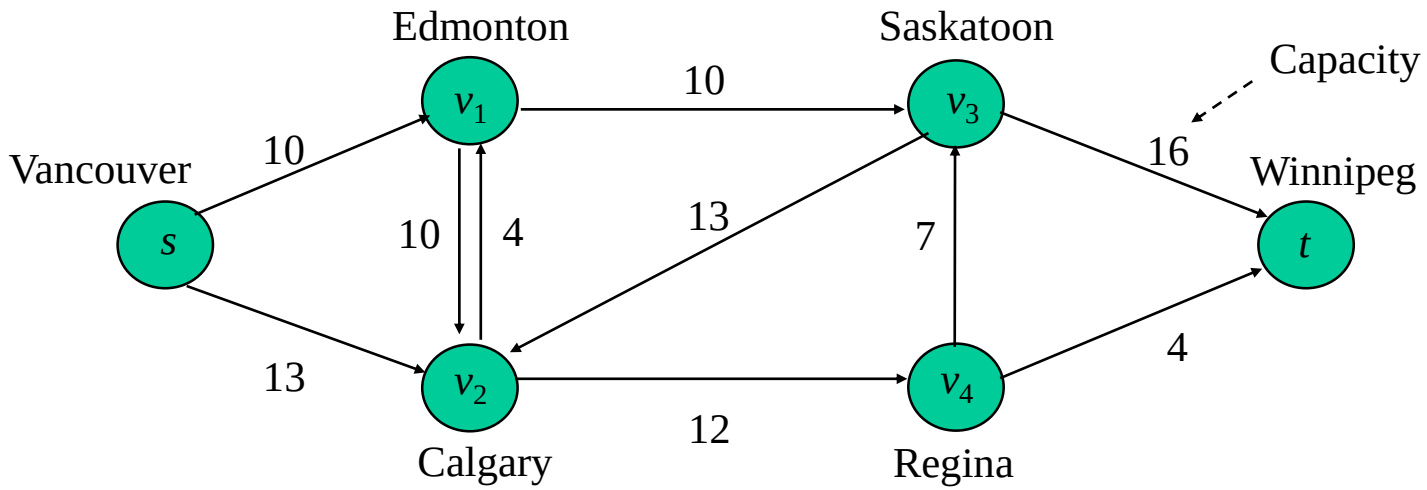
5.(20) Trace the computation process when applying Ford-Fulkerson algorithm to the following net work.



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6.(20) Let *p = ababcaba and t = abababcababcaba*. Apply Knuth-Morris-Pratt algorithm to them to find all the matches of *p* in *s*. Give the computation process.