

CSE 101 Spring 2020

Quiz 4

Solutions

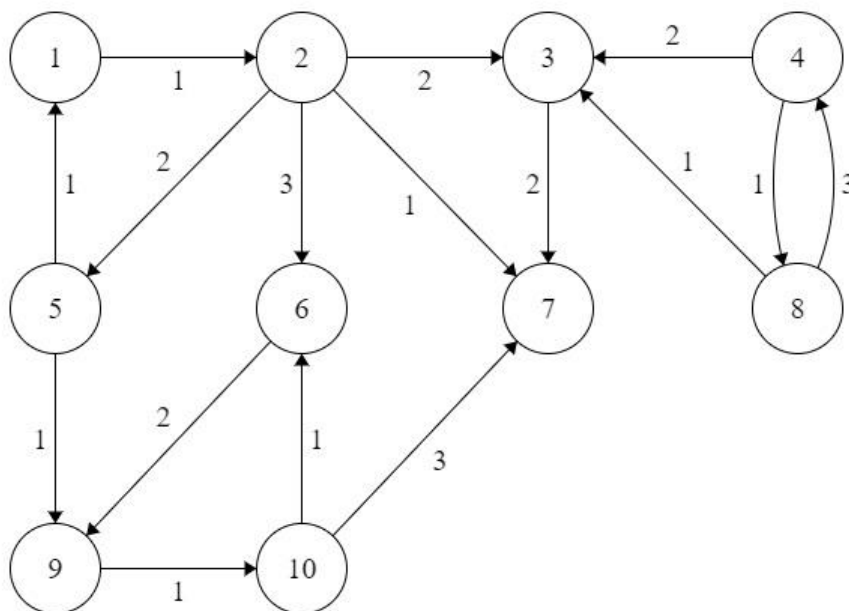
1. (20 Points) Insert the keys: 5 8 3 4 6 1 9 2 7 (in order) into an initially empty Binary Search Tree. Draw your BST on scratch paper, then determine all ways in which the colors Red and Black can be assigned to the nodes in this tree such that the Red-Black Tree properties are satisfied. State (a) the number of such color assignments, and (b) specify each assignment by stating exactly which nodes are to be colored Red.

Solution:

- (a) There are 2 distinct ways to assign colors to satisfy the RBT properties.
(b) The two ways are: (1) assign 2 and 7 to be Red, the others Black, and (2) assign 2, 3, 7, 8 to be Red and all others Black.
2. (30 Points) Perform Dijkstra(G, s) on the weighted digraph below with source vertex $s = 5$. Refer to the pseudo-code in the book, or at

<https://classes.soe.ucsc.edu/cse101/Spring20/Examples/Pseudo-Code/GraphAlgorithms>.

If at some point two vertices have equal minimum d -values, remove the one with smaller label first.



- a. (10 Points) Determine the order in which vertices are removed from the min Priority Queue.

Solution: 5 1 9 2 10 6 7 3 4 8

- b. (10 Points) For each vertex x , determine the value $d[x]$.

- c. (10 Points) For each vertex x , determine the value $p[x]$.

Solution to (a) and (b):

x	1	2	3	4	5	6	7	8	9	10
$d[x]$	1	2	4	inf	0	3	3	inf	1	2
$p[x]$	5	1	2	nil	n	10	2	nil	5	9