June 6th 2017 CSC226 Assigment#2 V00786970

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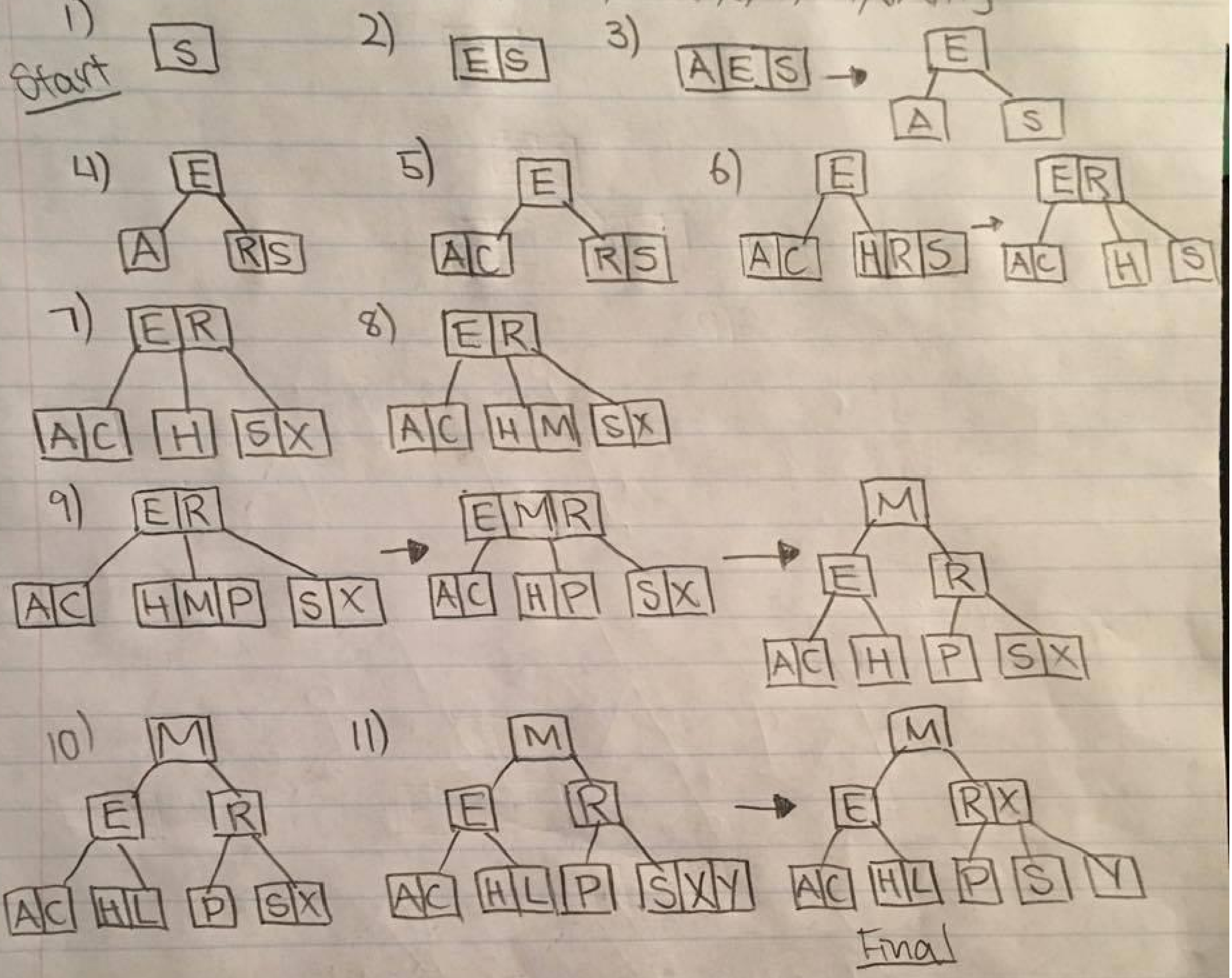
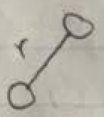
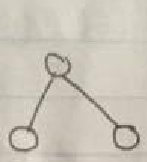
#1) Draw 2-3 Tree {~~S~~, ~~E~~, ~~A~~, ~~R~~, ~~C~~, ~~H~~, X, ~~M~~, ~~P~~, ~~L~~, ~~Y~~}



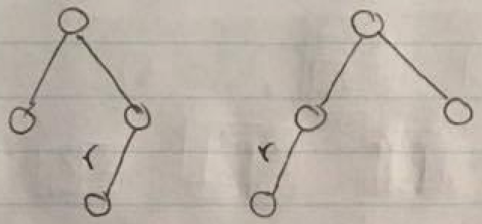
#2) n=2



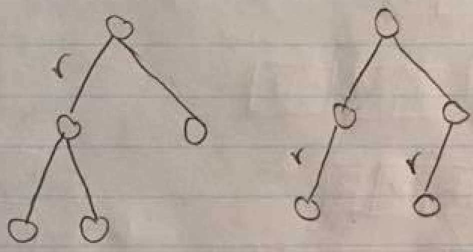
n=3



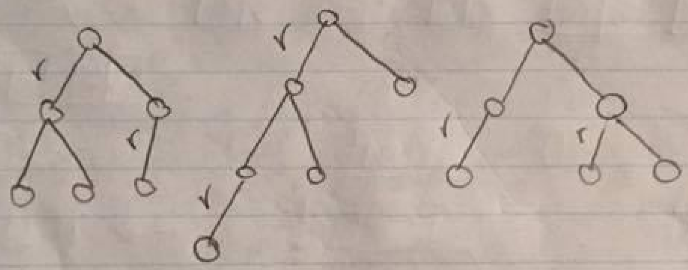
n=4



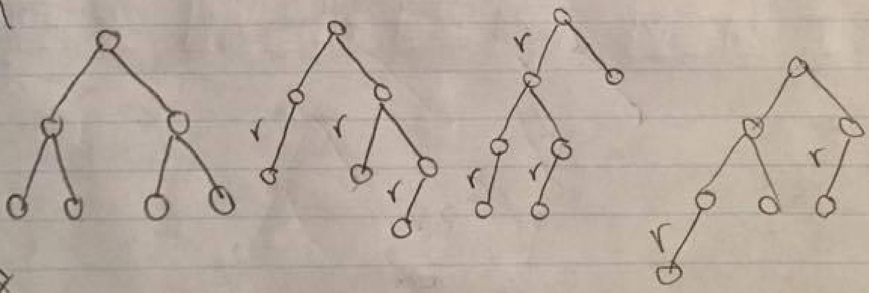
n=5



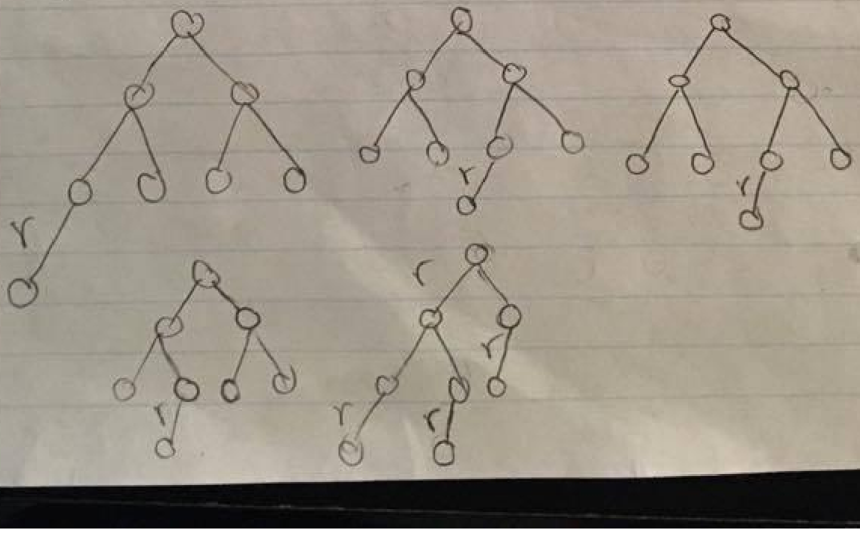
n=6



n=7



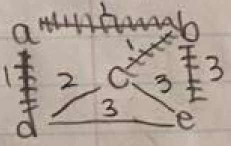
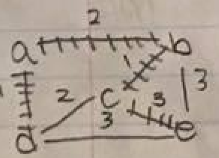
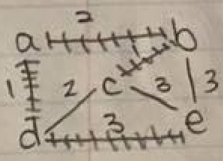
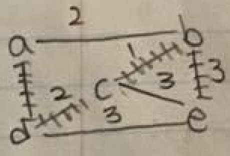
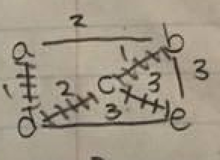
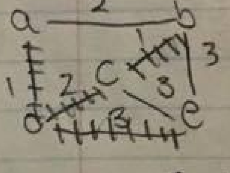
n=8



#3) The RedBlack Tree can be use to compute inversions in permutiation by keep track of a sum of inversions. All items in sequence are added into tree. when a node is entered to left of tree after its necessary rotations, we add amount of nodes to the right of it into sum After tree is built, the sum should equal to the number of inversions. Because we are adding n items to tree, the put() gets call n times. Thus, put() run is O(log n) since it is a balanced binary The modification to put function so it will result in O(nlogn) is

```
if (cmp <0) {
    h.left = put(h.left, key, val);
    inversions += size(h.right)+1;
}
```

#4)

		edges	weight	Profile
1)		(a,b), (a,d), (b,c), (b,e) 2 1 1 3	= 7	1,1,2,3
2)		(a,b), (a,d), (b,c), (c,e) 2 1 1 3	= 7	1,1,2,3
3)		(a,b), (a,d), (b,c), (d,e) 2 1 1 3	= 7	1,1,2,3
4)		(a,d), (b,c), (b,e), (c,d) 1 1 3 2	= 7	1,1,2,3
5)		(a,d), (b,c), (c,e), (c,d) 1 1 3 2	= 7	1,1,2,3
6)		(a,d), (b,c), (c,d), (d,e) 1 1 2 3	= 7	1,1,2,3

∴ can have multiple rates of MST as long as they all have the same minimum weight and profile.

#5) Left Leaning Red Black BST Results

	Testfiles.txt	nanosecond	Percentage
	test10.txt	3,795,281	20%
	test100.txt	2,600,079	3%
	test1000.txt	2,796,922	0,6%
Random Generator	10^4	6,968,521	25.286316%
	10^5	14,978,118	25.382332%
	10^6	21,173,371	25.332478%
	10^3	4,651,496	26.626625%

Based on our result, we can observe the phenomena of having 25-26% of Red nodes within RedBlack BST from the random generator. However, when running test file, we result in various range of Red node percentage. This could be caused by the sequence of number from the test file having values that are already in some what an order, this will result in minimum Red. Therefore, from the results can draw hypothesis of RedBlack Tree contains 25-26% of Red nodes within the tree on average.