CS 202 HW4
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Question 1)

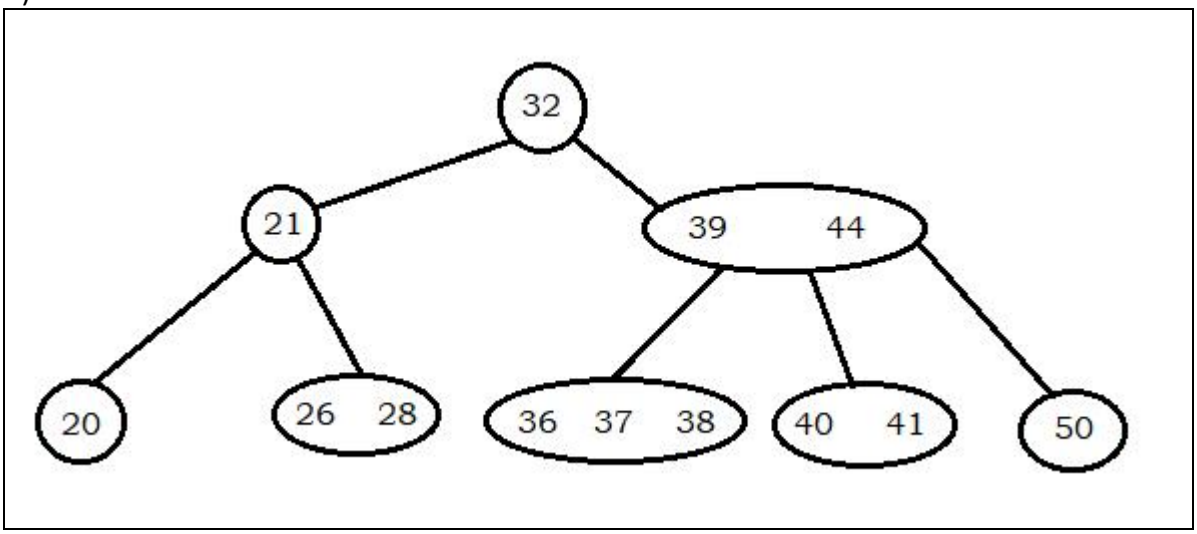
A) Maximum height of a red black tree is 2 * log(n+1).

B) AVL trees contains the balance factor and height in their nodes and red black trees does not contain these values, hence, AVL trees have more space complexity.

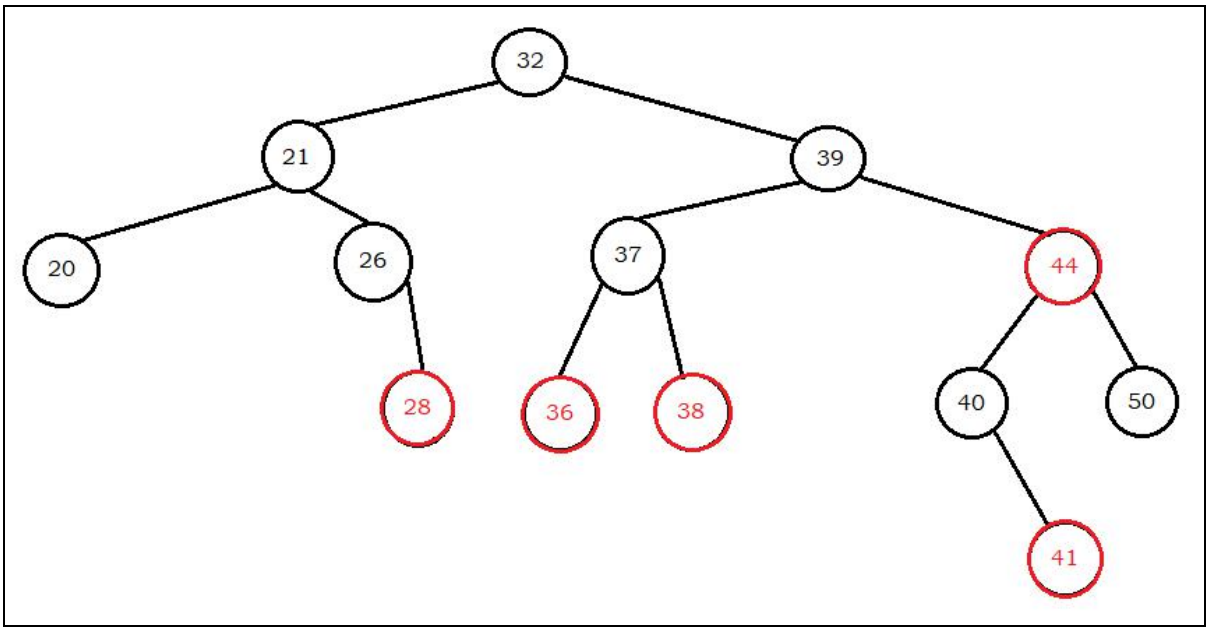
C) The stopping criteria is: when all of the vertices are visited and no more vertices are left to visit. Then, the algorithm terminates.

Question 2)

A)



B)

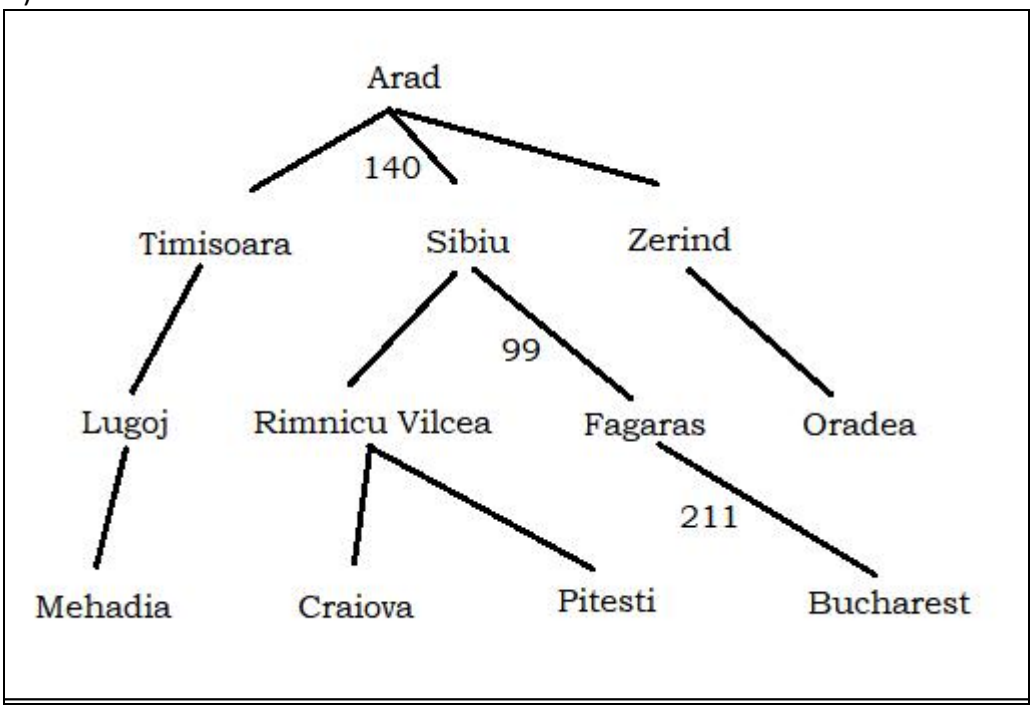


C)

Current Vertex	V1	V2	V3	V4
Initial state	Infinite	Infinite	Infinite	Infinite
V5	3	Infinite	Infinite	Infinite
V1	3	4	Infinite	4
V2	3	4	7	4
V4	3	4	6	4
V3	3	4	6	4

Hence, The shortest path from v5 to v3 is as follows:
V5 --> V1 --> V4 --> V3
And the path length is 6.

D)

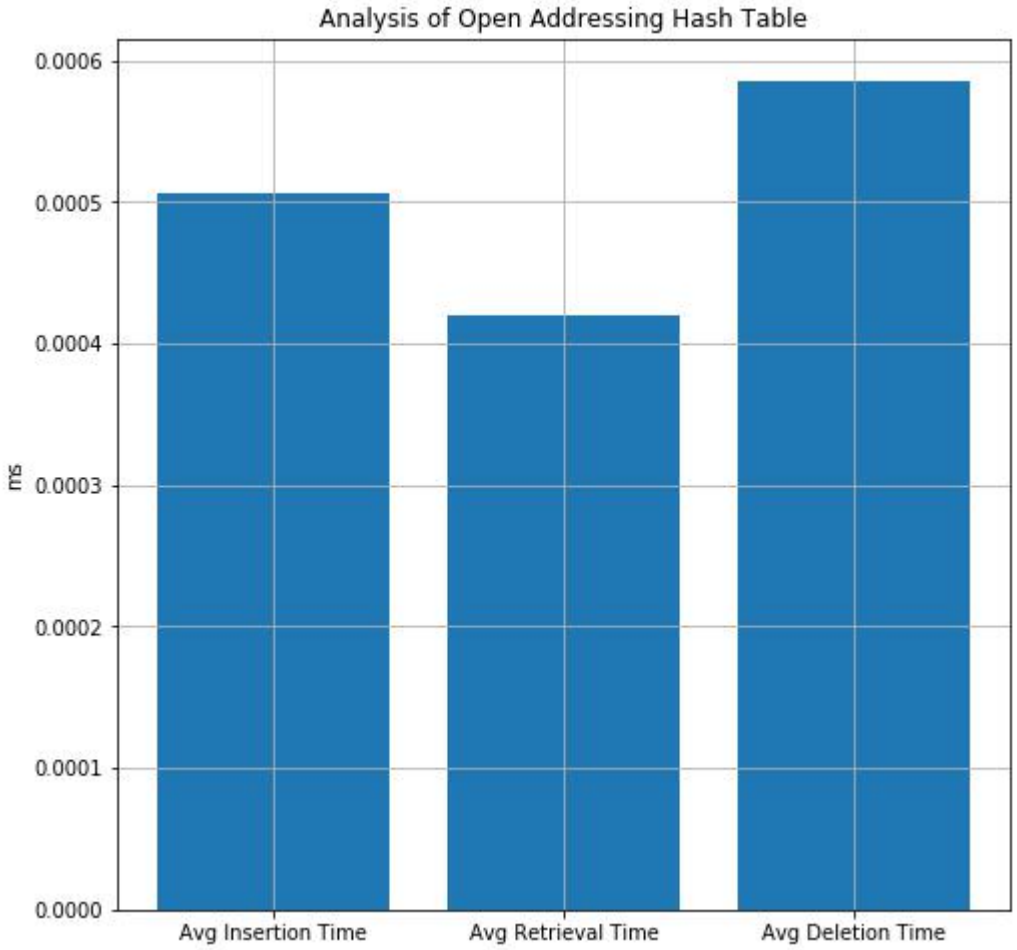


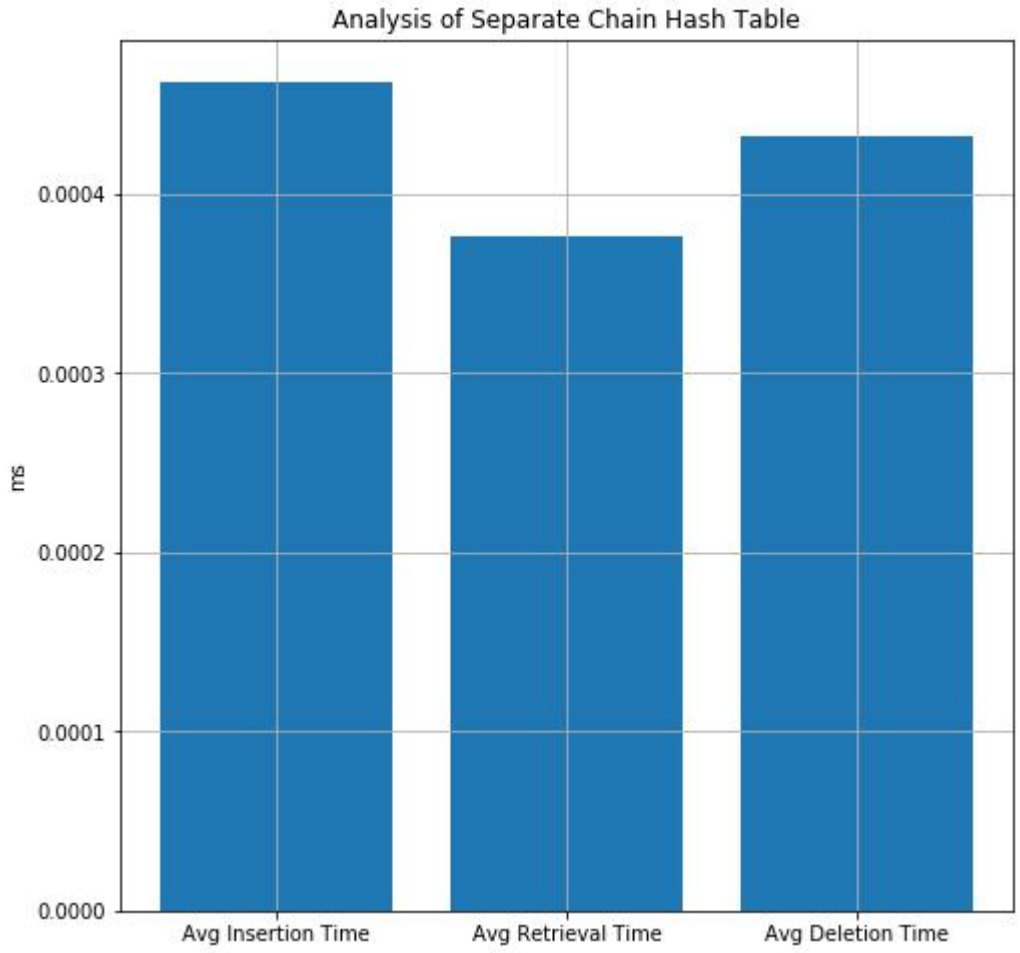
Length of the path = 140 + 99 + 211 = 450

Question 3)

A) Reasoning for choosing hash function: Ihave chosen the hash sunction in which I am summing up the asc 2 character values of the string and after, I am dividing it to hashTable size and I am obtaining the hashKey. The reason why I have chosen it is that it was very easy to implement. In addition, according to the slides, this method would be inefficient if we would have very big tables because for example if we would have a Table size of 10000 and a key length smaller or equal to 8, the hash function could assume values only between 0 and 1016. However, because our table sizes are small in size which are 161 and 50, it does not affect the overall efficiency. 47 and 161 is chosen because of being a prime number and gives uniform distribution.

F)





Part a - Analysis of Open Addressing Hash Table

Parameter	Time Elapsed
Average Insertion Time	0.000506711 ms
Average Retrieval Time	0.00042 ms
Average Deletion Time	0.000586 ms

Number of comparisons in Retrieval = 2.12356
Number of collisions in Insertion = 2.12752

Part b - Analysis of Separate Chain Hash Table

Parameter	Time Elapsed
Average Insertion Time	0.000463087
Average Retrieval Time	0.000377
Average Deletion Time	0.000432

Number of comparisons in Retrieval = 2.41227 ms
