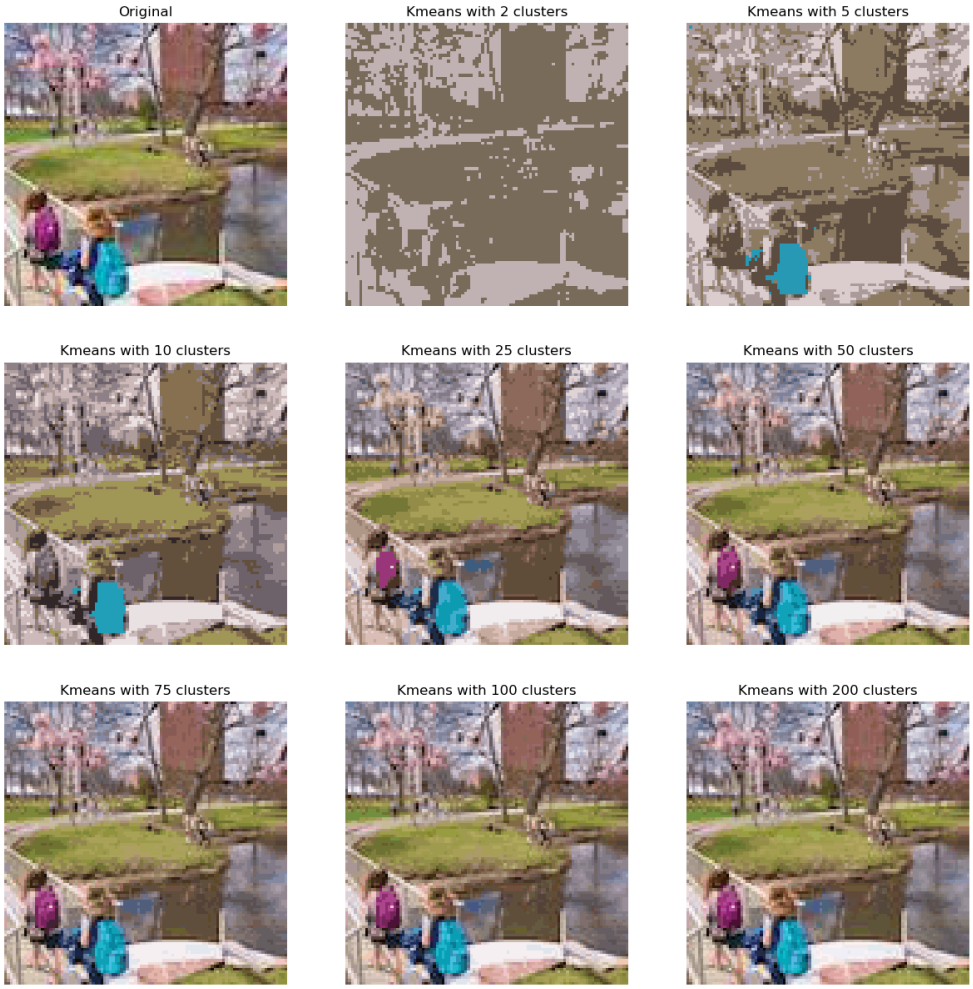
Question 1

Please look at the code



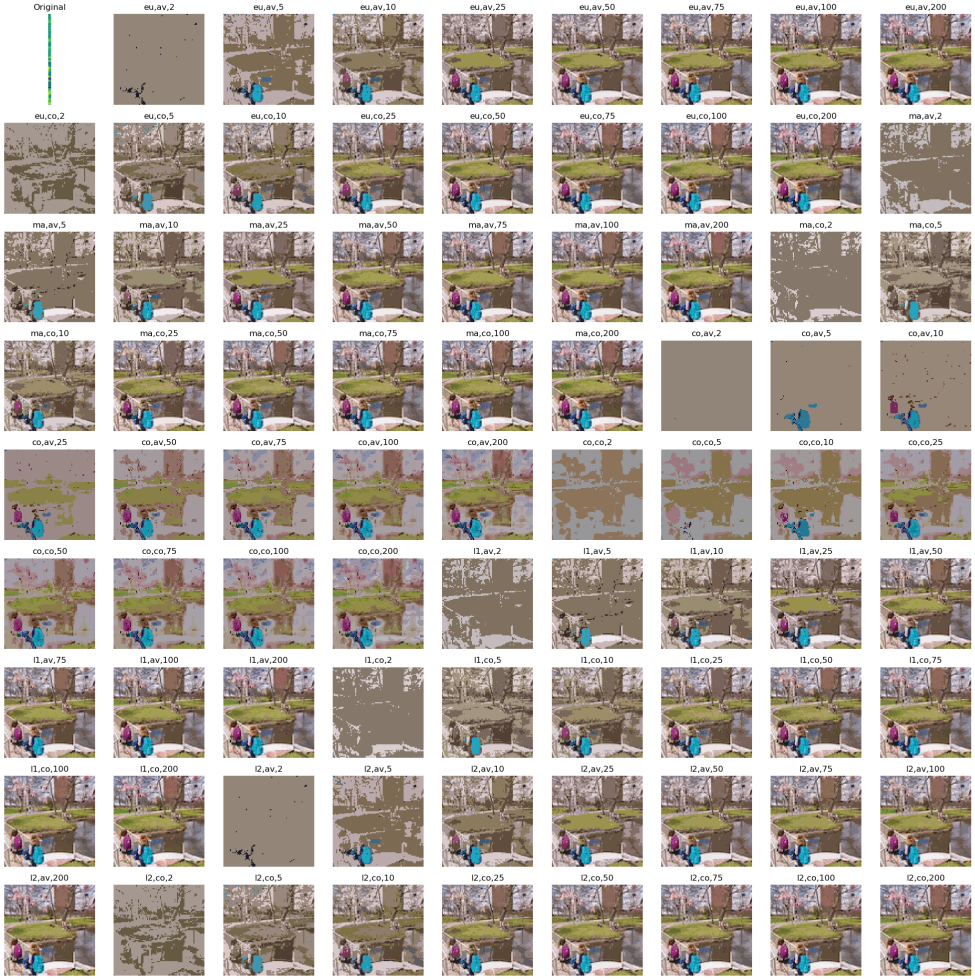
Question 2

Based on the 9*9 graph, I think the best one is Euclidean with Complete, since this one have the best compression.

Question 3

Note: I created a table with 9*9 grid, if you want to look at the pictures clearly, please zoom in the whole PDF. Also, the title of those

pictures are abbreviated in its parameters.



Question 4

k	Kmeans	HAC
2	9.92904325703	9.95085590959
5	9.44031602578	9.8329327602
10	8.74400365965	9.31725996918
25	7.73391017964	8.4213973504
50	6.92284623547	7.7536915939

75	6.2828072282	7.29576132651
100	5.83930075723	6.89471295027
200	4.78724694719	5.77561829302

Question 5

Based on the graph that I plotted, I would recommend using K-Means with cluster = 25. On the graph, when the k reaches to 25, the slope has a dramatic change, but after that, the slope is getting small. So, I would choose k = 25. For elbow, it' s also a good choice of k for k = 25 because the improvement it produces is low and the run time is high.