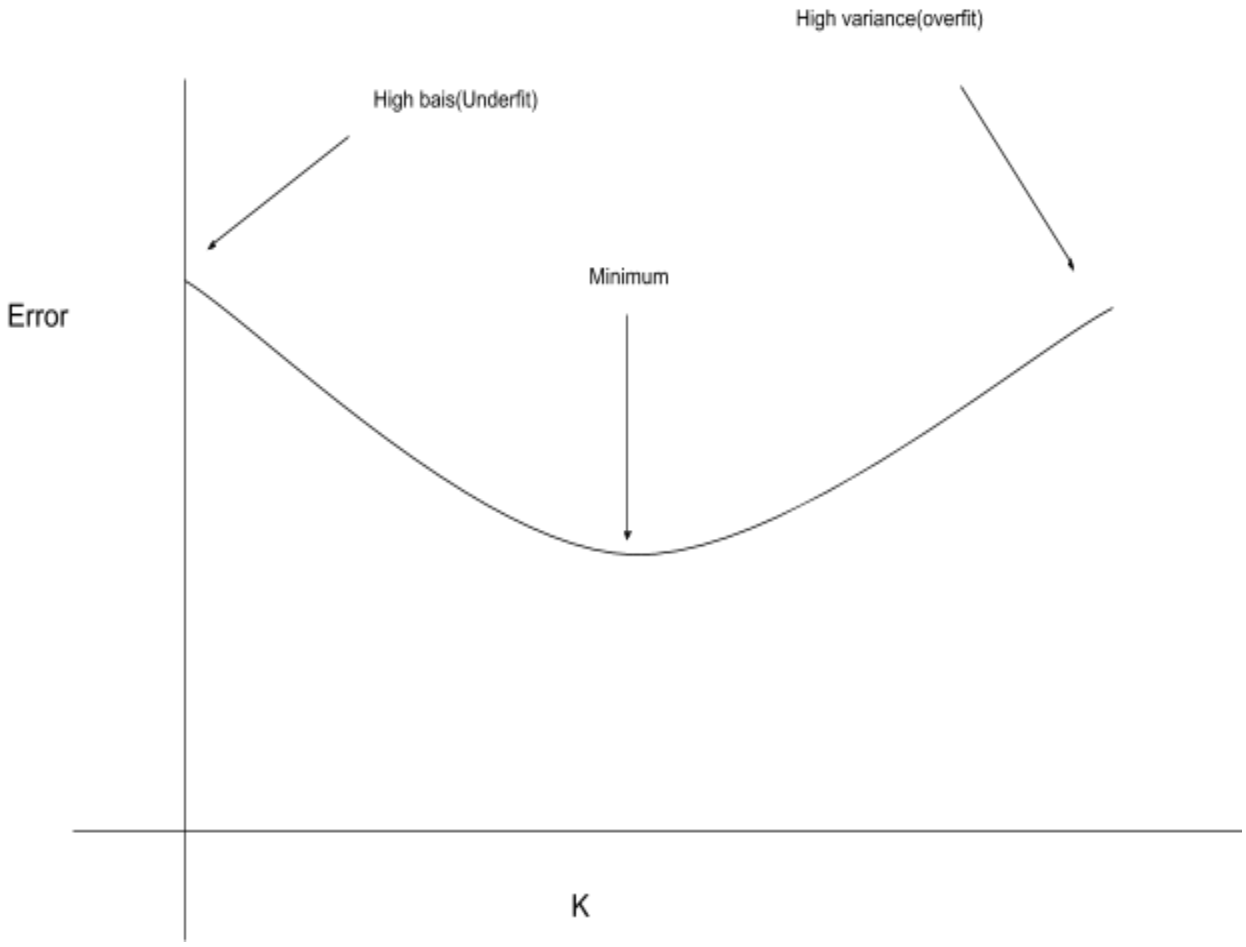
Question 1

1. For k = 1 in knn the training error will be 0, because when the value of k = 1 the nearest neighbour will be itself and all points will be trained in their own class. As we increase k from 1 to N the training error will increase and the training error will be maximum at N because on increasing value of K we start accepting the neighbours from different classes which increases the error ∴ At k == N the train error will be maximum.
2. For generalization error will be like a parabola higher at ends and lower at mid. Because when the k=1 we will train the model on high bais and when we keep k = N the model will have high variance. Or in other words, when k is less the model will underfit and when k is high the model will overfit. A diagram as below:



3. As the dimensionality increases the computation of distances is very inefficient and algorithm becomes slow and due to higher dimension there may be some irrelevant attributes adding wrong distance measurement and increasing the errors.
4. When we have a univariate decision tree the separation boundary is parallel to the axis but from the voronoi diagram of 1NN it can be seen that, it is not exactly that case. So it is not possible to split in such a manner.