O(n) ---> initialization

O(n) ---creating priority queue

u=Extract-min() ----> O(logn) -----> O(nlogn)

(in worst case)

For each u, inner for-loop will be executed d number of times where d is the degree of u

In total, inner loop will be executed

$\sum_i d_i$=O(m) where m= number of edges

decrease-key() ---O(logn) ---->O(mlogn)

Total running time = O(nlogn) + O(mlogn) =O((m+n)logn)

For loosely connected graph

$$m \cong n$$

Total running time = =O((n+n)logn)=O(nlogn)