SUHAS JAIN 19CS30048

8)

(a) Step 1 :-

for $x_1 \dots x_N$

→ find $\|x_1 - z_1\|_2$, $\|x_2 - z_2\|_2$, $\dots \|x_n - z_n\|$

for one term.

n subtraction
n addition
n multiplication.

$\simeq (3n)$ operations.

across all iterations

$\simeq (3n)k$

→ find minimum among them.

k operations.

Total $= (3n+1)k$ operations.

Across all terms $= (3n+1)k \times N$

Complexity $\simeq O(nkN)$ Ans

(b) Step 2 :-

for all $j = 1, \dots, k$,

$$z_j = \frac{1}{|C_j|} \sum x_i \{\text{such that } c_i = j\}$$

Total sums $= nN$

Total divisions $= k$.

Total Complexity $\simeq nN + k$. Ans

Combining both steps.

$\simeq nKN + nN + K$ (normally $K < \in n$)

$\approx O(Kn N)$

for 10 iterations.

$= (3n+1)NK + nN + K.$

$K = 10$

$= 31nN + 10N + 10$ Ans