2

Then the square S_0 is contained in $B_\delta(x)$ as shown.
At the next stage S is subdivided into 4 squares, each contained in $B_\delta(x)$ — if we take any point in one of the other three squares, x_{k+1} say, then $|x-x_{k+1}|<\delta$. Now let $k\to\infty$ then we can let $\delta\to 0$ while satisfying $\delta > \sqrt{2}/4^k$ so for any $\delta>0$ we can find $x, y\in F$ such that $|x-y|<\delta$ and every open set containing some $x\in F$ contains some $y\in F$ distinct from $x \ni x\in F$ then x is a limit point of F.

Right idea

Could be better expressed

$\frac{3}{4}$

iii) That F is totally disconnected was proved in i) where we showed that F is a union of distinct singleton sets. Not sufficient

$\frac{1}{5}$

$\frac{19}{25}$

For each $k\in\mathbb{N}$, each component of E_k contains a point in F.
Thus if $x\in F$, then, for each $k\in N$, there exists $x_k\in F$ with $|x_k - x|\le \frac{1}{4^{k-1}}$, so that $x_k\to x$ as $k\to\infty$. Thus, x is a limit point of F.

+ If x and y are in the same component of E_k for each $k\in N$, then $|x-y|\le \sqrt{2}/4^k$, for each $k\in N$, so $x=y$.
Thus, if x and y are distinct points in F, then there exists $k\in N$ such that x and y belong to different components $E_{k,x}$ and $E_{k,y}$ of E_k.
There exist disjoint open sets U and V such that

P.T.O.