Correctness of Algorithm:

Let T be set containing Terminals, V be set of All vertices, E be edges of the given graph.

```
steiner-Tree (G, T)
{
    for each t ∈ T do
        for each v ∈ V
            ST[t][v] = dist(t, v)

    for (m = 2 to m ≤ |T| ) do  —— Ⓐ
    {       for each subset X of size 'm' do  — Ⓑ
                for each v ∈ V
                {   ST[X][V] = ∞
                    for each u ∈ V do
    Ⓒ  ←——          {   for each non disjoint non empt
                        subset Combination of X do
                        {  let x', x'' disjoint subset.
                           ~~Sum~~  Sum = min ( sum, ST[x'][u] +
                                          ST[x''][u] ).
                        }
                    ST[X][V] = min ( ST[X][V] , sum+dist
            }.
            if |X| = = |T|
                return ST[X][~~v~~ last terminal].
    }.
```

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```
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{
    for each  t ∈ T  do
        for each  v ∈ V
            ST[t][v] = dist(t, v)

    for (m = 2  to  m ≤ |T| )  do                                —— (A)
    {     for each subset x q size 'm' do                        — (B)
               for each  u ∈ V
                    {  ST[x][v] = ∞
                       for each  u ∈ V  do
                         {
          (C) <——————      for each non disjoint non empt
                              subset Combination q X do
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Loop Invariant: at the start of each iteration of A we have ~~an~~ minimum stiener wieght for all terminal ~~[illegible]~~ subset of size |m-1|.

Initialization: Just before first iteration of loop Ⓐ we have all one size terminal set stienerer wieght ~~and~~ value in ST[][] array [from base Case].

Maintanance: Inorder to prove loop invariant, we need to take a look inside each loops inside loop Ⓐ. In loop Ⓑ we are generating all 'm' size subset, so All a 'm' ~~[illegible]~~ size subset are generated. Using that in loop Ⓔ we are generating All disjoint nonempty subset of X [x' and x'', $x' \cap x'' = \phi$ $x' \vee x'' = x$}, x', x'' ≠ ϕ]. since by optimal substructre property the ST[x'][v] and ST[x''][v] will be already filled in table ∵ |x'| & |x''| < m. so in loop Ⓒ we will take minimum value from all subset and fill the ST[x][v] from most optimum value with help of All pair shortest path graph

~~[illegible]~~ " ∴ after each ~~a~~ ith the iteration of loop Ⓐ we have filled up ~~[illegible]~~ (i+2-1)th size subset. value ~~to~~ in ST[][] ~~[illegible]~~ matrix.

Termination: when m = |T|+1 loop Ⓐ All ~~[illegible]~~ value ~~subset~~ in ST[][] graph has been filled and ST[~~[illegible]~~ T][T.least()] will return minimum value of stiener tree.

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In short :

loop (A) will emulate all 'm' sized subset of T.

But due to optimal substructre property we have Stener table filled for all subset of T of size less than m.

loop (B) will generate all subset of taken size m.

thus loop (B) ensure filling of ~~ad~~ $^{|T|}C_m$ subset in ST[][] table.

loop (C) will enumerate all subset of subset taken from loop (B) and filled ~~table~~ ST[][] table from all ~~given~~ possible ~~subset~~ disjoint non empty subset partition of given input X. minimum value is taken From all posible enumeration.

- filling of DP table is bottom up By using fact of optimal decomposition property of given problem.