Number of spanning Trees

asked in **Graph Theory** Nov 15, 2017 4,414 views

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Hi,

As all of us knows number of spanning tree of **simple labeled graph** could be computed by the Kirchhoff's theorem.

But is there any other method (other than Brute force) to compute the number of spanning tree of given general graph ?

Formula for number of spanning tree possible in Simple Labeled Complete graph(K_n) and Simple Labeled Complete Bipartite graph($K_{m,n}$) are n^{n-2} and $n^{m-1}m^{n-1}$ respectively.

If anyone can state simple proof for above mentioned formula then it will great help.

spanning-tree **algorithms** **graph-theory**

Chhotu 4.4k views

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11 Comments

Rupendra Choudhary commented Nov 15, 2017

one direct way to calculate ST (not MST) which i use is choose 'v-1' edges out of 'e' edges (graph contain 'v' number of vertices and 'e' number of edges)and then substract those 'v-1' edges which will result in cycle.

About proof of # of spanning tree in complete graph , it's by cayley's formula. you can see proof there.

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chandra sai commented Dec 31, 2017

@rupendra bro

Why to subtract v-1 edges in the end?

Please explain with an example if possible.

Thanks in advance

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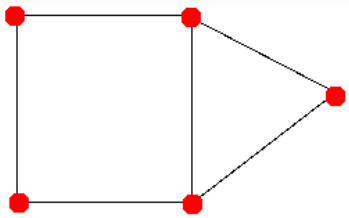

See this graph there are $v = 5$ vertices and $e = 6$ edges. We know spanning tree contains $v - 1$ edges.So we first select $v - 1$ edges from total e edges.

So it's like $\binom{6}{4}$. But out of those ways there may be some way which is resulting in a cycle , eliminate those.We can observe there are 4 such possibilities which are causing cycle

1)this rectangular

2) triangle and one non-common edge of rectangular (there are 3 such edges of rectangular so 3 ways)

so total= $\binom{6}{4} - 4 = 11$ Spanning trees

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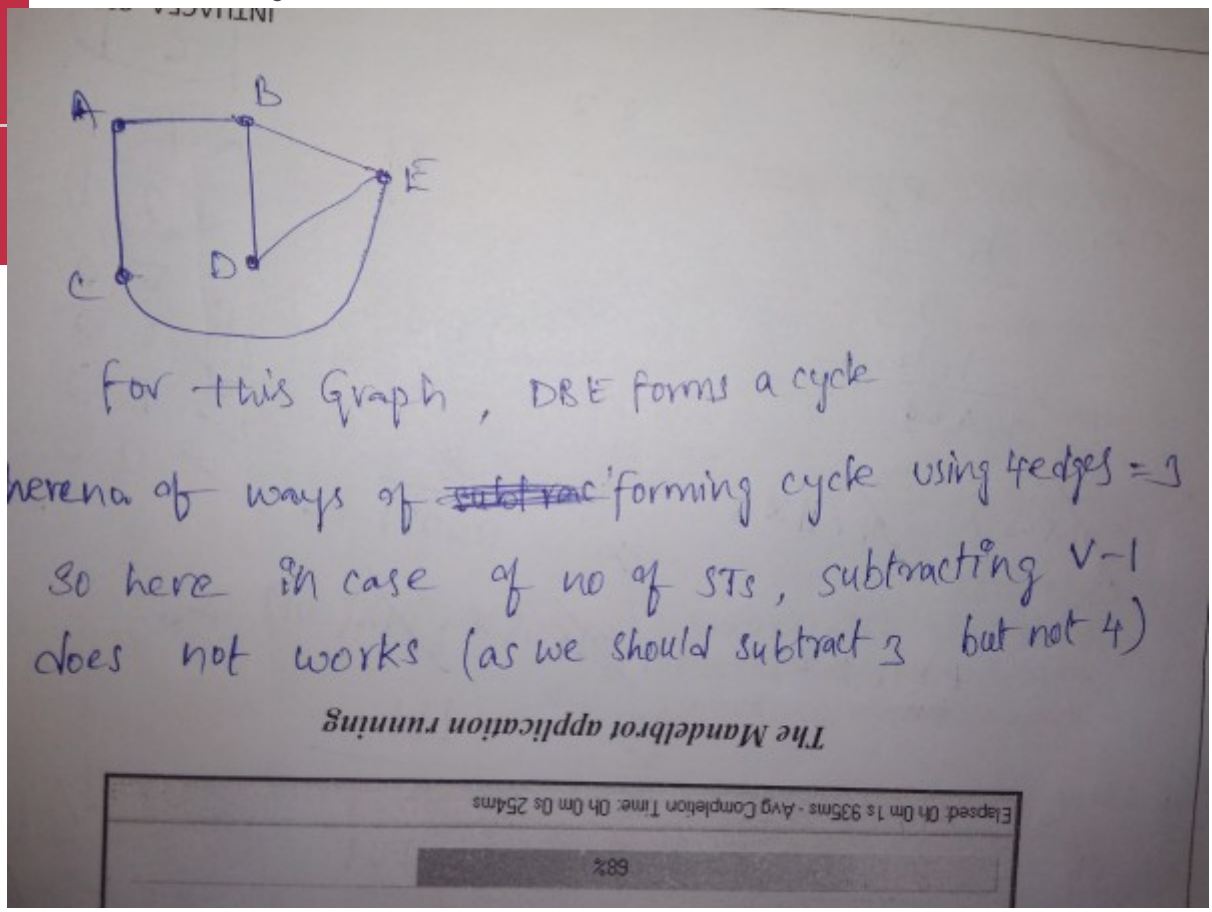
Chandra sai commented Jan 1, 2018

Correct me if iam wrong



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Rupendra Choudhary commented Jan 1, 2018

Please try to write clearly , because in that way we both can save our time.

you see this graph is isomorphic to the graph i provided in my example.

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chandra sai commented Jan 1, 2018

got my doubt clarified thank you sir

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Harish Kumar 2 commented Jan 19, 2018

Hi rupendra,

I was also thinking about the same approach but was getting answer for complete graphs as I was not substracting the number of cycles formed. Thanks for adding that point.

But now also I am calculating the same by this approach and the formula n^n-2. But both of the answers are not same.

Am I missing some thing. Can you please explain if possible for K5.

Thanks in advance.

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Rupendra Choudhary commented Jan 19, 2018

Hello harish

Number of total possible spanning trees in K_5

$Method\,1)$:- $n^{n-2} = 5^3 = 125$

$Method\,2)$:- $\binom{10}{4} - 15 - 70 = 125$

in K_5 total edges $=10$ so for spnning tree we have to choose 4 edges out of those 10 edges.Now substract those 4 edges which are causing some cycle.We can see cycle can be possible in two ways , first cycle itself can be of 4 vertices and second when cycle is of 3 vertices.

number of ways to have a cycle of length 4 from a complete graph of 5 vertices$= 15$

https://gateoverflow.in/473/gate2012-38

Number of ways to have a cycle of 3vertices $= 10$,Now to choose 4th vertex we have total $10 - 3 = 7$ ways so total became=$10 * 7 = 70$

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Harish Kumar 2 commented Jan 20, 2018

Thanks rupendra, I got it now.

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Can you please explain how you are getting 4 cycles.

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dheerwani commented Nov 21, 2019

Can you please tell which 4 are the cycles?

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Pl r register to answer this question.

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7 ↗ #1

Number of minimum spanning trees

The number of distinct minimum spanning trees for the weighted graph shown below is _____.

asked in Graph Theory Jan 18, 2018

1 ↗ #2

No of spanning Trees

Let K_n denote the complete undirected graph with n vertices where n is an even number. Find the maximum number of spanning trees of K_n that can be formed in such a way that no two of these spanning trees have a common edge.

0 #3

Q1) Why is the path between a pair of vertices in a minimum Spanning tree of an undirected graph not the shortest(minimum weight) path?

asked in Mathematical Logic Aug 31, 2018

5 #4

Number of spanning tress

How do we come up with this formula for number of spanning tree of a n vertex complete graph Kn= n^{n-2}

asked in Algorithms Mar 18, 2018

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