CON101 Assignment

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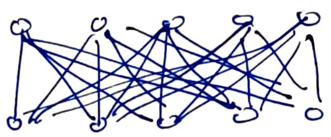
Solution 1: Direct proof :-

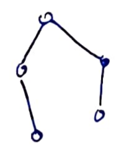
Using the condition in the for-loop, we just need to ensure that every edge of G, i.e.
$\forall e \in E(G) : \exists e = (u,v)$ in G. Either $e \in H$, in which case $d_H(u,v) = 1$, else it was not considered.
This is because by description of Algorithm, H already consists a path $_uP_v : |_uP_v| \leq K$.

Solution 2: ~~Increase in vertices~~ Increase in edges should be $\Theta(n^2)$.

G: 

This is what is called a complete Bipartite Graph.

Solution 3: Proof :



we know that a tree has n-1 edges.

M.Sp. of $K = n-1$.

Since maximum distance in H is $\leq n-1$, and since minimum distance in G is 1. Hence H is a spanning tree.

Solution 4: Proof by contradiction! Assume converse (i.e $|C| \leq K+1$)
Take any u,v in C ; but $\because$: $dist_G(u,v) \leq K+1-1$,
$\leq K$

But this is not possible because of the condition inside for-loop in the given algorithm.
Hence our assumption is wrong. Therefore $\forall C \in H$:
$|H| > K+1$.