Superconnectivity of Bipartite Digraphs and Graphs

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Abstract

A maximally connected digraph $G$ is said to be super-$\kappa$ if all its minimum dis-connecting sets are trivial. Analogously, $G$ is called super-$\lambda$ if it is maximally arc-connected and all its minimum arc-disconnecting sets are trivial. It is first proved that any bipartite digraph $G$ with diameter $D$ is super-$\kappa$ if $D \leq 2\ell - 1$, and it is super-$\lambda$ if $D \leq 2\ell$, where $\ell$ denotes a parameter related to the number of short paths. These results allow us to show that if the order of a bipartite digraph $G$ is big enough then superconnectivity is attained. For instance, if $G$ is $d$-regular and has diameter $D = 3$ and $\ell \geq 1$, then $G$ is super-$\lambda$ if $n > 4d$; and if $D = 4$ and $\ell \geq 2$, then $G$ is super-$\kappa$ if $n > 4d^2$. In these cases the results are proved to be best possible. Similar results are given for bipartite (undirected) graphs. (For a graph it turns out that $\ell = (g - 2)/2$, where $g$ stands for the girth.)

Key words. bipartite (directed) graph, superconnectivity, diameter, girth, order, line digraph

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