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Pancyclism and Bipancyclism of Hamiltonian Graphs

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A graph G on n vertices is called pancyclic if it contains cycles of every length k, for $3 \leqslant k \leqslant n$. A bipartite graph on $2n$ vertices is called bipancyclic if it contains cycles of every even length $2k$, for $2 \leqslant k \leqslant n$.

In this paper, we consider only finite, undirected graphs without loops or multipie edges.

We shall give a new sufficient condition ensuring a Hamiltonian graph to be pancyclic (or bipancyclic), The main results are the following two theorems.

Theorem A. Let G be a Hamiltonian graph of order n. If there exisis a vertex $x \in V(G)$ such that $d(x)+d(y) \geqslant n$ for each y not adjacent to x, then G is either pancyclic or $K(n/2, n/2)$. And the bound is best possible .

Theorem B. Let $G=(X, Y; E)$ be a Hamiltonian bipartite graph with $|X| = |Y| = n > 3$. If there exists a vertex $x \in X$ such that $d(x)+d(y) \geqslant n+1$ for each $y \in Y$ not adjacent to x, then G is bipancyclic. And the bound is best possible.

Using Theorem A and Theorem B, we can easily establish the following

Corollary C. Let G be a Hamiltonian graph on n ver tices. If $\triangle(G)+\delta(G) \geqslant n$, then G is either pancyclic or $K(n/2, n/2)$.

Corollary D. Let $G=(X, Y; E)$ be a Hamiltonian bipartite graph with $|X| = |Y| = n > 3$. If $\triangle(x)+\delta(y) \geqslant n+1$, then G is bipancyclic, where $\triangle(X)=\max\{d(x): x \in X\}$, $\delta(Y)=\min\{d(y): y \in Y\}$.

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