# Pancyclicity of Hypercube Variants

**郭俊宏、黃鈴玲**

E-mail: 9707435@mail.dyu.edu.tw

**ABSTRACT**

Let G = (V, E) be a graph. For any two vertices x, y ? – , a cycle C is called (x, y)-geodesic if there exists a shortest x-y path of G lies on C. A graph G is weakly-geodesic r-pancyclic if for any two vertices x, y ? V, there exists a (x, y)-geodesic of every length ranging from max{2d(x, y), r} to ?鞔?? A graph G is geodesic r-pancyclic if for any two vertices x, y ? – and any shortest x-y path P, there exists a (x, y)-geodesic l-cycle containing P, where l is any integer between max{2d(x, y), r} to ?鞔?駉nclusive. A bipartite graph G is weakly-geodesic (+r)-bipancyclic if for any two vertices x, y ? – , there exists a (x, y)-geodesic cycle of every even length ranging from 2d(x, y) + r to ?鞔?? In this thesis, we shall show that the k-ary n-cube is geodesic 3-pancyclic when k = 3, and weakly-geodesic (+2)-bipancyclic when k is even. For any two vertices x, y ? – , a cycle C is called (x, y)-balanced if the distance dC(x, y) = max{dC(u, v) | u, v ? – } when G is not bipartite, and dC(x, y) = max{dC(u, v) | x, u ?， , and y, v ?、} when G is bipartite with bipartitions A, B, and x ?， , y ?、. A graph G is balanced r-pancyclic if for any two vertices x, y ? – , there exists a (x, y)-balanced cycle of every length ranging from max{2d(x, y), r} to ?鞔?? A graph G is balanced (+r)-bipancyclic if for any two vertices x, y ? V, there exists a (x, y)-balanced cycle of every even length ranging from 2d(x, y) + r to ?鞔?? In this thesis, we shall show that the k-ary n-cube is balanced 5-pancyclic when k = 3, and balanced (+2)-bipancyclic when k>2 is even.

Keywords : geodesic pancyclic ; balanced pancyclic ; k-ary n-cube

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