Eigenvalues and \([a, b]\)-factors in regular graphs

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For positive integers, \(r \geq 3, h \geq 1, \) and \(k \geq 1, \) Bollobás, Saito, and Wormald proved some sufficient conditions for an \(h\)-edge-connected \(r\)-regular graph to have a \(k\)-factor in 1985. Lu gave an upper bound for the third-largest eigenvalue in a connected \(r\)-regular graph to have a \(k\)-factor in 2010. Gu found an upper bound for certain eigenvalues in an \(h\)-edge-connected \(r\)-regular graph to have a \(k\)-factor in 2014.

For positive integers \(a \leq b, \) an even (or odd) \([a, b]\)-factor of a graph \(G\) is a spanning subgraph \(H\) such that for each vertex \(v \in V(G), \) \(d_H(v)\) is even (or odd) and \(a \leq d_H(v) \leq b. \) In this talk, we provide best upper bounds (in terms of \(a, b, \) and \(r\) for certain eigenvalues (in terms of \(a, b, r, \) and \(h\) in an \(h\)-edge-connected \(r\)-regular graph \(G\) to guarantee the existence of an even \([a, b]\)-factor or an odd \([a, b]\)-factor. This result extends the one of Bollobás, Saito, and Wormald, the one of Lu, and the one of Gu.