On some applications
of Rieman-Hurwitz formula for graphs

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We present a few versions of the Riemann-Hurwitz formula for a regular branched covering of graphs. By a graph, we mean a finite connected multigraph. The genus of a graph is defined as the rank of the first homology group. We consider a finite group acting on a graph, possibly with fixed and reversible edges, and the respective factor graph. Then, the obtained Riemann-Hurwitz formula relates genus of the graph with genus of the factor graph and orders of the vertex and edge stabilisers. As an applications upper and lower bounds on the order of finite group acting free on the set of edges on a graph are obtained. This makes possible to find discrete versions of the Hurwitz, Accola-Maclachlan, Oikawa and Arakawa theorems.