



A Step Toward Happy Ending to Free Vibration Analysis of Cracked Members

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Abstract: Analysis of free vibration of cracked members has been under active study in the last three decades. In these studies the member is divided into several segments with a crack in between each two. Using the general solution for each segment, the boundary conditions and the compatibility equations at cracked points the problem reduces to the solution of a system of equations. The order of the system depends on the number of cracks. As a result only members with few cracks were considered. In this paper a single governing equation for each multi-cracked member is developed. The derived governing equation is a simple ordinary differential equation and is solved using the finite element formulation which is developed for this study. Since the effects of cracks appeared within the mass matrices of the formulated numerical problem, modelling the singularities due to cracks was not needed. The computation of mass matrices is much easier than that of the stiffness of members with singularity, hence resulting in reduction computational time and effort. The proposed formulation is implemented in an at home software. Using this software several examples were analyzed. Comparison of the results with that of commercial software verified the work.

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