

## Dynamic Analysis of Cylindrical and Conical Helices by Mixed FEM<sup>†</sup>

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### ABSTRACT

*Engineers often come face to face with helical springs especially in the applications of civil and mechanical engineering. In this study, free vibration analysis has been performed regarding cylindrical and conical helices. For this purpose, the necessary element matrix based on Timoshenko beam theory and consistent mass matrix of these helices with variable cross sections were derived according to the mixed FE method. The consistent mass matrix formulation is preferred since its angular frequencies are more accurate as compared to the lumped mass formulation. The numerical results obtained in this study are compared with analytical, experimental and other numerical studies in the current literature. It is observed that, the results of the proposed FE formulation are quite satisfactory for engineering requirements.*

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