Error Amount in Viscoelasticity Analysis Depending on Time Step Size and Method used in ANSYS

Authors : A. Fettahoglu

Abstract : Theory of viscoelasticity is used by many researchers to represent behavior of many materials such as pavements on roads or bridges. Several researches used analytical methods and rheology to predict the material behaviors of simple models. Today, more complex engineering structures are analyzed using Finite Element Method, in which material behavior is embedded by means of three dimensional viscoelastic material laws. As a result, structures of unordinary geometry and domain like pavements of bridges can be analyzed by means of Finite Element Method and three dimensional viscoelastic equations. In the scope of this study, rheological models embedded in ANSYS, namely, generalized Maxwell elements and Prony series, which are two methods used by ANSYS to represent viscoelastic material behavior, are presented explicitly. Subsequently, a practical problem, which has an analytical solution given in literature, is used to verify the applicability of viscoelasticity tool embedded in ANSYS. Finally, amount of error in the results of ANSYS is compared with the analytical results to indicate the influence of used method and time step size.