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# *INVESTIGATION OF FLEXURAL – TORSION INSTABILITY OF PILES BY MODIFIED NEWMARK METHOD*

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## *Abstract*

*The aim of this dissertation is to introduce a new approximate procedure on the basis of the Newmark method, which can treat the structural stability problem without the aforementioned shortcomings. The emphasis of the methodology is that it has sufficient power to generalise different types of stability problems, and is well suited to the use of computers. The major objectives of this thesis are categorised in two parts. The first part, which constitutes the main hypothesis and idea, is devoted to developing a procedure here in called the Modified Newmark Method. the response of these kind of structures under the loading, namely the relationship between the displacement field and the loading field, can be predicted by the solution of these differential equations and on satisfying the given boundary conditions. When the effect of change of geometry under loading is taken into account in modeling of equilibrium state, then these differential equations are partially integrable in quartered. They also exhibit instability characteristics when the structures are loaded compressively.*

*The purpose of this Paper is to represent the ability of the Modified Newmark Method to analyses the flexural-tensional instability of strut for both bifurcation and non-bifurcation structural systems , and the results are shown to be very accurate with only a small number of iterations. The method is easily programmed, and has the advantages of simplicity and speeds of convergence and easily is extended to treat material and geometric nonlinearity including no prismatic members and linear and nonlinear spring restraints that would be encountered in frames. In this Paper these abilities of the method will be extended to the system of linear differential equations that govern strut flexural torsional stability*

## *Introduction*

*Three possible modes exist in which centrally loaded piles can buckle: They can bend in the plane of one of the principal axes and buckle laterally[ Figure(1.1) ] ; they can twist about the shear centre axis, called torsional buckling [ Figure(1.2) ]; and they can bend and twist simultaneously, called flexural-torsional buckling [ Figure (1.3) ]. One of these three modes will be critical for any given strut, depending on its length and the geometry of its cross-section. For most hot-rolled structural steel sections, Eulerian or flexural buckling is the critical mode. This, however, is not the case for thin-walled open sections especially for cold-formed sections. A slender pile having an open thin-walled cross-section with a relatively small torsional rigidity can lose its stability under axial compressive load through a buckling failure caused by bending, torsion or a combination of both these factors*