International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development(IJCSEIERD)
ISSN(P): 2249-6866; ISSN(E): 2249-7978
Vol. 6, Issue 1, Feb 2016, 31-50

TORSIONAL VIBRATIONS OF DOUBLY-SYMMETRIC THIN-WALLED I-BEAMS RESTING ON WINKLER-PASTERNAK FOUNDATION USING DYNAMIC MATRIX METHOD

A. SAI KUMAR[1] & K. SRINIVASA RAO[2]

[1]*Research Scholar, Department of Mechanical Engineering, Vasavi College of Engineering (Autonomous), Ibrahimbagh, Hyderabad, Telangana, India*

[2]*Associate Professor, Department of Mechanical Engineering, Vasavi College of Engineering (Autonomous), Ibrahimbagh, Hyderabad, Telangana, India*

ABSTRACT

The present work deals with Dynamic Stiffness Analysis of free torsional vibration of doubly symmetric thin-walled beams of open section and resting on Winkler-Pasternak elastic foundation. A new dynamic stiffness matrix is developed in this paper which includes the effects of warping and Winkler-Pasternak foundation on its frequencies of vibration. The resulting transcendental frequency equations for all classical and various special boundary conditions are solved for thin-walled beams of open cross section for varying values of warping Winkler and Pasternak foundation parameters on its frequencies of vibration.

A new MATLAB computer program has been developed based on the dynamic stiffness matrix approach to solve the highly transcendental frequency equations and to accurately determine the torsional natural frequencies for all classical and various special boundary conditions. The MATLAB code developed consists of a master program based on modified BISECTION method and to call specific subroutines to set up the dynamic stiffness matrix to perform various parametric calculations. Numerical results for natural frequencies for various values of warping and Winkler and Pasternak foundation parameters are obtained and presented in graphical form showing their parametric influence clearly.

KEYWORDS: Warping, Dynamic Stiffness Matrix, Winkler-Pasternak Foundation, MATLAB, Bisection Method

Received: Dec 29, 2015; **Accepted:** Jan 07, 2016; **Published:** Jan 19, 2016; **Paper Id.:** IJCSEIERDFEB20164

Original Article