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Theoretical Study Regarding the Modes Shapes of Wood Beam Having Different Boundary Conditions Using the Eigenvalues Problems

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SUMMARY

In engineering practice, however, beams problems often involve consideration of dynamic disturbances, produced by time-dependent external forces or displacements. Structural dynamics deals with time-dependent motions of structures and analyzes the internal forces associated with them. Thus, its objective is to determine the effect of vibrations on the performance of the structure. It can be started from the case of a homogeneous beam with different boundary conditions at the ends. By applying the principle of D'Alembert for an infinitesimal beam element, the equation of free transverse vibrations of the beam. The equation of the normal vibration modes, along with the homogeneous boundary conditions describe a type Sturm-Liouville problem. Solving type Sturm –Liouville problems allows the determination of inherent values λ, and the functions of the vibration shapes of beams. The normal vibration modes for several/more combinations of conditions at the ends of the beam are determined. The following cases are studied: simply supported beam, having the shape function $y_i = H_i(x)$; doubly-clamped beam, having the shape function $y_i = G_i(x)$; clamped-free beam, having the shape function $y_i = \Psi_i(x)$; clamped –simply supported beam, having the shape function $y_i = J_i(x)$; simply supported -free beam, having the shape function $y_i = F_i(x)$; free at both ends beam, having the shape function, $y_i = \Phi_i(x)$.

Keywords: beam, free vibrations, mode shapes, eigenvalues, eigenfunctions

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