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Random Base Excitation of Timoshenko Beam Traversed by Moving Load

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Abstract

The study of dynamic response of Timoshenko beam traversed by moving load subjected to random base excitation is carried out. By applying the theory of dynamic response of Timoshenko beam as well as finite element theory, beam finite element governing equations of motion are developed and they are solved using Galerkin method. To validate the model, some results of the model are compared with those available in literatures and very close agreement is achieved. The beam is subjected to travelling load and random base excitation in lateral direction simultaneously. Three types of boundary conditions, namely, hinged-hinged, hinged-clamped, and the clamped-clamped ends, are considered and beam dynamic behavior; such as deflection, velocity, and bending moment of beam midpoint, with all so-called boundary conditions are studied. To get better understanding of base excitation effects on the beam dynamic performance, all the results are presented with and without base excitation, in which considerably difference is observed. Moreover, the effect of base excitation on beam with different span-length is monitored.

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