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Rotor Dynamic Analysis for a Shaft Train by Using Finite Element Method

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Abstract : In the present paper, a large turbo-generator shaft train including a heavy-duty gas turbine engine, a coupling, and a generator is established. The method of analysis is based on finite element simplified model for lateral and torsional vibration calculation. The basic elements of rotor are the shafts and the disks which are represented as circular cross section flexible beams and rigid body elements, respectively. For more accurate results, the gyroscopic effect and bearing dynamics coefficients and function of rotation are taken into account, and for the influence of shear effect, rotor has been modeled in the form of Timoshenko beam. Lateral critical speeds, critical speed map, damped mode shapes, Campbell diagram, zones of instability, amplitudes, phase angles response due to synchronous forces of excitation and amplification factor are calculated. Also, in the present paper, the effect of imbalanced rotor and effects of changing in internal force and temperature are studied.

Keywords : rotor dynamic analysis, finite element method, shaft train, Campbell diagram
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