

Finite Element Formulation and Analysis of Rotating Systems

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ABSTRACT

The purposes of the paper are to develop an elastic formulation system of rotary elements and to approach the curve of rotors' frequencies with respect to angular velocity in the gyroscopic conservative system. In the study, the analysis of free vibration with gyroscopic is divided into the following objects, first, to formulate the governing equations of the element using Hamilton's principle, second, to employ the finite element method with governing equations, we convert successfully into standard form of eigenvalue problems, third, to run a FORTRAN program written under the VAX computer to calculate complex form of eigenvalues. The element used in the paper is a rotary model based on uniform 3D beam element which has two nodes with one reference point and has three translations and three rotational deformations each one nodes in the three dimension space system which undergoes a general rotational motion, so the proper composition can model driving shaft, rotating beam, crankshaft, and so on. For confirming its feasibility and correctness, we have some cases respectively to be compared with the finite element program COSMOSM and papers, that have good results under both stationary and rotational conditions. In addition, we can skillfully obtain the matrix form of governing equations for the nodes of the element through the help of the symbolic computation program, and convert into the program language form. Its advantages are to decrease the time spent on writing a program and to avoid the human errors. The elastic formulation system has haply finished by the symbolic computation program in conjunction with finite element method.

Keywords : Rotor ; Finite Element Method ; Vibration ; Crank Shaft

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