عنوان مقاله:

Forced Response of a Low-Pressure Turbine Blade using Spectral/hp Element Method: Direct Numerical Simulation

محل انتشار:

مجله مکانیک کاربردی و محاسباتی, دوره 7, شماره 1 (سال: 1400)

تعداد صفحات اصل مقاله: 13

نویسندگان:

Daniel H. Wacks - *Department of Mechanical & Construction Engineering, Northumbria University, Newcastle upon Tyne, NE۱ ۸ST, UK*

Mahdi E. Nakhchi - *Department of Mechanical & Construction Engineering, Northumbria University, Newcastle upon Tyne, NE۱ ۸ST, UK*

Mohammad Rahmati - *Department of Mechanical & Construction Engineering, Northumbria University, Newcastle upon Tyne, NE۱ ۸ST, UK*

خلاصه مقاله:

The Spectral/HP element method has been applied to perform Direct Numerical Simulations (DNS) over a single T۱۰۶A turbine blade-row using the open source software Nektar++. The main goal of the current study is to perform preliminary investigations at modest Reynolds and Mach numbers, ۸۰۰۰ and ۰.۱ respectively, for uniform, steady flow past the aerofoil by employing Nektar++'s solver for the ۲D Navier-Stokes equations for incompressible flow. The mesh was firstly validated against results obtained using the same software and for a similar set of parameter values. One dimensional, pitch-wise harmonic vibrations were subsequently imposed on the blade by means of a coordinate transformation. A parametric study in terms of the frequency and amplitude of the vibrations was carried out. The effects of the vibrations on entire domain, along the blade surface and in its wake were assessed. The pressure on the blade surface and the wake loss were each decomposed into components arising due to the mean flow and due to the vibrations. In each case the dominant components were then identified for the values of frequency and amplitude considered here.

کلمات کلیدی:

DNS, Spectral/hp element method, Low-pressure turbine, Blade vibrations