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

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 High-order approximate solutions of strongly nonlinear cubic-quintic Duffing oscillator based on the harmonic balance method (Article)

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Abstract

In this paper, a new reliable analytical technique has been introduced based on the Harmonic Balance Method (HBM) to determine higher-order approximate solutions of the strongly nonlinear cubic-quintic Duffing oscillator. The application of the HBM leads to very complicated sets of nonlinear algebraic equations. In this technique, the high-order nonlinear algebraic equations are approximated in the form of a power series solution, and this solution produces desired results even for small as well as large amplitudes of oscillation. Moreover, a suitable truncation formula is found in which the solution measures better results than existing results and it saves a lot of calculation. It is highly noteworthy that using the proposed technique, the third-order approximate solutions gives an excellent agreement as compared with the numerical solutions (considered to be exact). The proposed technique is applied to the strongly nonlinear cubic-quintic Duffing oscillator to reveal its novelty, reliability and wider applicability. © 2017 The Authors

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Author keywords

[Analytical solutions](#) [Approximate frequency](#) [Cubic-quintic Duffing oscillator](#) [Harmonic balance method](#) [Truncation principle](#)

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
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