

Document details

< Back to results | 1 of 2 Next >

Export Download Print E-mail Save to PDF Add to List More... >

Italian Journal of Pure and Applied Mathematics **Open Access**
Issue 37, January 2017, Pages 455-466

An analytical approximation technique for the duffing oscillator based on the energy balance method (Article)

Hosen, M.A.^a, Chowdhury, M.S.H.^b, Ali, M.Y.^a, Ismail, A.F.^c

^aDepartment of Manufacturing and Material Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, Malaysia

^bDepartment of Science in Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, Malaysia

^cDepartment of Mechanical Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, Malaysia

Abstract

View references (41)

In this paper, an analytical approximation technique has been presented of obtaining higher-order approximate solutions for highly nonlinear Duffing oscillator based on the energy balance method (EBM). Higher-order approximate natural frequencies have been obtained in a novel analytical way. The accuracy of the solution method is evaluated within an error analysis. It is highly remarkable that using the presented technique, the approximation solutions produce desired results even for large oscillation as compared with the exact ones. Moreover, the solution method yields much better results than existing solutions after using a suitable truncation formula. The presented technique is applied to well-known Duffing oscillator to illustrate its novelty, reliability and wider applicability.

Author keywords

Analytical approximate technique Duffing oscillator Energy balance method Truncation principle

Indexed keywords

Engineering controlled terms: Approximation theory Energy balance

Compendex keywords: Analytical approximate technique Analytical approximation Approximate solution

Approximation solution Duffing oscillator Energy balance method

Energy balance method (EBM) Truncation principle

Engineering main heading: Oscillators (mechanical)

ISSN: 11268042
Source Type: Journal
Original language: English

Document Type: Article
Publisher: Forum-Editrice Universitaria Udinese SRL

Metrics View all metrics >

2 Citations in Scopus

0 Field-Weighted Citation Impact



PlumX Metrics

Usage, Captures, Mentions, Social Media and Citations beyond Scopus.

Cited by 2 documents

Analytical approximations for the oscillators with anti-symmetric quadratic nonlinearity

Hosen, M.A., Chowdhury, M.S.H., Yeakub Ali, M. (2018) *Journal of Physics: Conference Series*

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

Chowdhury, M.S.H., Hosen, M.A., Ahmad, K. (2017) *Results in Physics*

View all 2 citing documents

Inform me when this document is cited in Scopus:

Set citation alert >

Set citation feed >

Related documents

A novel analytical approximation technique for highly nonlinear oscillators based on the energy balance method

Hosen, M.A., Chowdhury, M.S.H., Ali, M.Y. (2016) *Results in Physics*