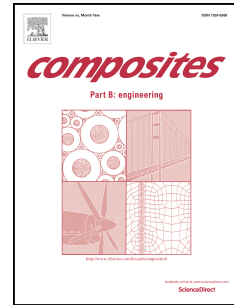


Accepted Manuscript

Static, free and forced vibration of functionally graded (FG) sandwich beams excited by two successive moving harmonic loads

Mesut Şimşek, Mohammed Al-shujairi



PII: S1359-8368(16)31408-1

DOI: [10.1016/j.compositesb.2016.09.098](https://doi.org/10.1016/j.compositesb.2016.09.098)

Reference: JCOMB 4590

To appear in: *Composites Part B*

Received Date: 25 July 2016

Accepted Date: 29 September 2016

Please cite this article as: Şimşek M, Al-shujairi M, Static, free and forced vibration of functionally graded (FG) sandwich beams excited by two successive moving harmonic loads, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.09.098.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Static, Free and Forced Vibration of Functionally Graded (FG) Sandwich Beams Excited by Two Successive Moving Harmonic Loads

Mesut Şimşek¹, Mohammed Al-shujairi^{2,3}

¹ *Tantavi Mah. Fevzi Çakmak Cad. Akyol Apt. No: 63/26 Ümraniye-Istanbul, Turkey*

² *Yildiz Technical University, Faculty of Civil Engineering, Department of Civil Engineering,
Davutpaşa Campus, 34210 Esenler-Istanbul, Turkey*

³ *University of Babylon, Collage of Engineering, Department of Mechanical Engineering, Iraq*

Abstract

This paper examines static, free and forced vibration of functionally graded (FG) sandwich beams under the action of double moving harmonic loads travelling with constant velocities using Timoshenko beam theory (TBT). Three different sandwich beam models with various cross-sectional shape and various boundary conditions are considered. It is assumed that in FG part of sandwich beams, the material properties vary continuously through the thickness of the beam according to simple power-law form. The problem is formulated based on the energy approach. For this purpose, the unknown displacement functions are approximated by using the simple polynomials together with the auxiliary functions for satisfying the essential boundary conditions. The equations of the motion are obtained by using the Lagrange's equations, and solved with the help of the implicit time integration method of Newmark- β . In this study, the effects of the different sandwich beam models, boundary conditions, gradient index, the velocity, excitation frequency and the phase angles of the two successive harmonic loads, and the distance between the loads on the mechanical behavior of sandwich beams are discussed in detail. At the same time, extensive static and free vibration results are presented to check the reliability of the present formulation. Good agreement is observed.

Keywords: A. Layered structures; B. Vibration; C. Computational modelling; C. Numerical analysis

¹ Corresponding Author: Tel: +905323540006
E-Mail address: mesutsimsek@gmail.com

Download English Version:

<https://daneshyari.com/en/article/5021672>

Download Persian Version:

<https://daneshyari.com/article/5021672>

[Daneshyari.com](https://daneshyari.com)