Numerical Approach to a Cantilever Beam Equation With One End Simply Supported and Other End Fixed

Seshadev Padhi[1], Peeyush Tewari[1], and Prabal Datta[1]

[1]Birla Institute of Technology

May 10, 2022

Abstract

The existence of an approximate solution to the fourth-order boundary value problem (BVP) \begin{eqnarray} u^{(4)}(t) = h(t)f(u(t))+g(t), \quad t \in [0, 1], \nonumber\\ u(0) = \alpha, u^{\prime}(1)= \beta, u(1) = \gamma, u^{\prime\prime}(0) = \delta, \nonumber \end{eqnarray} is investigated using a new inverse operator, where $f,g,h \in C(\mathbb{R}, \mathbb{R})$, and α, β, γ and δ are real numbers. As an application, we apply the inverse operator and ADM to study the existence of an approximate solution of the Cantilever beam equation whose one end simply-supported with other end fixed \begin{eqnarray} u^{(4)}(t) = h(t)f(u(t))+g(t), \quad t \in [0, 1], \nonumber\\ u(0) = 0, u^{\prime}(1)= 0, u(1) = 0, u^{\prime\prime}(0) = 0, \nonumber \end{eqnarray} where f,g and $h \in C(\mathbb{R}, \mathbb{R})$. Our examples shows that the proposed inverse operator and the application ADM gives very less errors in the obtained approximate solution when compared to the exact solution of the Cantilever beam problems.

Hosted file

`Artile_in_AMA_Format.pdf` available at https://authorea.com/users/470219/articles/568540-numerical-approach-to-a-cantilever-beam-equation-with-one-end-simply-supported-and-other-end-fixed

Hosted file

`Artile_in_AMA_Format.tex` available at https://authorea.com/users/470219/articles/568540-numerical-approach-to-a-cantilever-beam-equation-with-one-end-simply-supported-and-other-end-fixed