**Collocation Method for Nonlinear Vibration of Beam**

***Amin GHANNADİASL[C:\Users\Abdullah\AppData\Local\Microsoft\Windows\INetCache\Content.Word\ORCID-iD_icon-16x16.gif](https://orcid.org/0000-0003-2669-2319)***

*Department of Civil Engineering, Faculty of Engineering, University of Mohaghegh Ardbili, Iran*

|  |
| --- |
| **Abstract**  The collocation method is the method for the numerical solution of integral equations and partial and ordinary diﬀerential equations. The main idea of this method is to choose a number of points in the domain and a ﬁnite-dimensional space of candidate solutions. So, that solution satisﬁes the governing equation at the collocation points. An overview of the formulation, analysis and implementation of orthogonal spline collocation is provided for numerical solution of differential equations in two space variables by Bialecki and Fairweather [1]. The sextic B-spline function for numerical solution of a system of second-order boundary value problems is presented by Rashidinia et al. [2]. On the other hand, the quartic B-spline collocation method is applied for numerical solution of Burgers’ equation by Saka and Dağ [3]. Quintic nonpolynomial B-spline collocation for a fourth-order boundary value problem is investigated by Ramadan et al. [4]. The results are shown that the quintic nonpolynomial B-spline collocation method presents better approximations. On the other hand, the presented method generalized all existing polynomial B-spline methods up to fourth-order. The current paper involves developing, and a comprehensive, step-by step procedure for applying the collocation method to the numerical solution of nonlinear vibration of beam. The simplicity of this approximation method makes it an ideal candidate for computer implementation. Finally, the numerical examples are introduced to show eﬃciency and applicability of quintic B-spline collocation method. Numerical results are demonstrated that quintic B-spline collocation method is very competitive for numerical solution of frequency analysis of beam. |
| Keywords: Collocation Method, Quintic B-spline, Nonlinear vibration, Beam |

**References**

1. Bialecki, B., & Fairweather, G., (2001) Orthogonal spline collocation methods for partial differential equations. *Journal of Computational and Applied Mathematics*, 128(1), 55-82.
2. Rashidinia, J., Jalilian, R., Mohammadi, R., & Ghasemi, M., (2007) Sextic spline method for the solution of a system of obstacle problems. *Applied mathematics and computation*, 190(2), 1669-1674.
3. Saka, B. & Dağ, İ. (2007) Quartic B-spline collocation method to the numerical solutions of the Burgers’ equation. *Chaos, Solitons and Fractals*, 32(3), 1125-1137.
4. Ramadan, M., Lashien, I., & Zahra, W., (2009) Quintic nonpolynomial spline solutions for fourth order two-point boundary value problem. *Communications in Nonlinear Science and Numerical Simulation*, 14(4), 1105-1114.