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Multipoint boundary value problems by differential quadrature method. (English)

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Summary: This paper extends the application of the differential quadrature method (DQM) to high order ($\geq 3^{rd}$) ordinary differential equations with the boundary conditions specified at multiple points ($\geq$ three different points). Explicit weighting coefficients for higher order derivatives have been derived using interpolating trigonometric polynomials. A three-point, linear third-order differential equation governing the shear deformation of sandwich beams is examined.

Two examples of four-point nonlinear fourth-order systems are also presented. Accurate results are obtained for the example problems. Since boundary conditions are usually specified only at two extreme ends and not at intermediate boundary points, the present work opens new areas of application of the DQM.

MSC:

65L10	Numerical solution of boundary value problems involving ordinary differential equations
74K10	Rods (beams, columns, shafts, arches, rings, etc.)
34B05	Linear boundary value problems for ordinary differential equations
65L60	Finite element, Rayleigh-Ritz, Galerkin and collocation methods for ordinary differential equations
34B10	Nonlocal and multipoint boundary value problems for ordinary differential equations
74S25	Spectral and related methods applied to problems in solid mechanics

Keywords:

numerical examples; differential quadraturemethod; generalized collocation method; multipoint boundary value problem; shear deformation of sandwich beams; four-point nonlinear fourth-order systems

Full Text: DOI

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