

Numerical Solution of Porous Media Equation Using Jacobi Operational Matrix

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Abstract : During modeling of transport phenomena in porous media, many nonlinear partial differential equations (NPDEs) encountered which greatly described the convection, diffusion and reaction process. To solve such types of nonlinear problems, a reliable and efficient technique is needed. In this article, the numerical solution of NPDEs encountered in porous media is derived. Here Jacobi collocation method is used to solve the considered problems which convert the NPDEs in systems of nonlinear algebraic equations that can be solved using Newton-Raphson method. The numerical results of some illustrative examples are reported to show the efficiency and high accuracy of the proposed approach. The comparison of the numerical results with the existing analytical results already reported in the literature and the error analysis for each example exhibited through graphs and tables confirms the exponential convergence rate of the proposed method.

Keywords : nonlinear porous media equation, shifted Jacobi polynomials, operational matrix, spectral collocation method

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