Sadeghi, S.; **Jafari, H.**; **Nemati, S.**

Solving fractional advection-diffusion equation using Genocchi operational matrix based on Atangana-Baleanu derivative. (English) Zbl 1473.35635

Discrete Contin. Dyn. Syst., Ser. S 14, No. 10, 3747-3761 (2021).

Summary: In recent years, a new definition of fractional derivative which has a nonlocal and non-singular kernel has been proposed by Atangana and Baleanu. This new definition is called the Atangana-Baleanu derivative. In this paper, we present a new technique to obtain the numerical solution of advection-diffusion equation containing Atangana-Baleanu derivative. For this purpose, we use the operational matrix of fractional integral based on Genocchi polynomials. An error bound is given for the approximation of a bivariate function using Genocchi polynomials. Finally, some examples are given to illustrate the applicability and efficiency of the proposed method.

MSC:

35R11 Fractional partial differential equations
35A35 Theoretical approximation in context of PDEs
35K15 Initial value problems for second-order parabolic equations

Keywords:

Atangana-Baleanu derivative; Atangana-Baleanu integral; advection-diffusion equation; operational matrix; Genocchi polynomials

Full Text: DOI

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