Review of the Tau method

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The Tau method, introduced for the first time by C. Lanczos [1] in 1938, in order to find approximate solution for some physical problems. In 1956, C. Lanczos and E. L. Ortiz introduced the recursive approach of the Tau method based on Canonical polynomials for numerical study of ordinary differential equation of the form

$$\sum_{i=0}^{\nu} p_i(x)y^{(i)}(x) = f(x), \quad g_j(y) = d_j, \qquad j = 1, ..., \nu \quad a \leq x \leq b, \tag{1}$$

where $p_i(x), f(x)$ are polynomials of finite degree and g_j are some linear functionals acting on $y(x)$ [2, 3]. The Operational approach of the Tau method is based on three simple operational matrices, that introduced for the first time in 1981 by E. L. Ortiz and H. Samara for numerical solution of nonlinear ordinary differential equations [4] and in 2002 it was extend by M. Hosseini and S. Shahmorad for numerical solution of linear integro-differential equations ([5]).

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