ABSTRACT

SOLVING THE SECOND ORDER NON LINEAR ORDINARY DIFFERENTIAL EQUATIONS WITH SUMUDU DECOMPOSITION METHOD

By

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A differential equation is a mathematical equation that relates some functions with its derivatives. There are linear and non linear differential equations. A non linear differential equation more difficult to be solved. A method that can be used to solve it is Sumudu decomposition method. This method contains Adomian decomposition method and Sumudu transform. Sumudu transform defined as

$$F_{(u)} = S\{f(t)\} = \int_0^\infty f(ut)e^{-t}\ dt, \qquad u \in (-r_1, r_2), t \geq 0.$$

The general solution of Adomian decomposition method is

$$y(t) = \sum_{n=0}^{\infty} y_n\,(t)$$

with non linear term defined as

$$Ny(t) = \sum_{i=0}^{\infty} A_i\,(y_0, y_1, y_2, \dots, y_n)$$

with

$$A_i = \frac{1}{i!}\left[\frac{d^i}{d\lambda^n} N\left(\sum_{k=0}^{\infty} \lambda^k u_k\right)\right]_{\lambda=0}$$

are Adomian polinomials, $i = 0,1,2, \dots$

Keywords : Ordinary differential equations, non linear ordinary differential equations, Sumudu transform, Adomian decomposition.

ABSTRAK

PENYELESAIAN PERSAMAAN DIFERENSIAL BIASA ORDE DUA NON LINEAR DENGAN METODE DEKOMPOSISI SUMUDU

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Persamaan diferensial biasa merupakan persamaan diferensial yang memuat turunan biasa. Terdapat persamaan biasa linear dan non linear. Persamaan diferensial biasa non linear cenderung lebih sulit diselesaikan. Salah satu metode yang digunakan untuk menentukan solusinya adalah metode dekomposisi Sumudu. Metode ini merupakan gabungan antara metode dekomposisi Adomian dan transformasi Sumudu. Transformasi Sumudu didefinisikan

$$F_{(u)} = S\{f(t)\} = \int_0^\infty f(ut)e^{-t}\ dt, \qquad u \in (-r_1, r_2), t \geq 0.$$

Sedangkan solusi umum metode dekomposisi Adomian dinyatakan

$$y(t) = \sum_{n=0}^{\infty} y_n\,(t)$$

Dengan suku non linearnya didefinisikan

$$Ny(t) = \sum_{i=0}^{\infty} A_i\,(y_0, y_1, y_2, \dots, y_n)$$

dengan

$$A_i = \frac{1}{i!}\left[\frac{d^i}{d\lambda^i} N\left(\sum_{k=0}^{\infty} \lambda^k u_k\right)\right]_{\lambda=0}$$

adalah polinomial Adomian, dengan $i = 0,1,2, \dots$

Kata kunci : Persamaan diferensial biasa, persamaan diferensial biasa non linear, transformasi Sumudu, dekomposisi Adomian.