

## THE SOLUTION OF STOCHASTIC TIME-DEPENDENT FIRST ORDER DELAY DIFFERENTIAL EQUATIONS USING BLOCK SIMPSON'S METHODS

B. O. OSU<sup>1,3</sup>, C. CHIBUISI<sup>2</sup>, G. A. EGBE<sup>3</sup> & V. C. EGENKONYE<sup>1</sup>

<sup>1</sup>Department of Mathematics, Michael Okpara University of Agriculture, Umudike, Nigeria

<sup>2</sup>Department of Insurance, University of Jos, Jos, Nigeria

<sup>3</sup>Department of Mathematics Abia State University Uturu, Nigeria

### ABSTRACT

*This paper deals with numerical solution of stochastic time-dependent delay differential equations (STDDDEs) using block Simpson's mechanism for pace number  $k = 2, 3$  and  $4$  without intercalation approach in calculating the delay term containing random values. The multistep collocation method was used to derive the discrete schemes of the proposed method through matrix inversion technique of each step number. The convergence and region of absolute stability of these discrete schemes were examined. The implementation of these discrete schemes was worked-out in block forms to solve some stochastic time-dependent first order delay differential equations. It was observed that the scheme for step number  $k = 4$  performed better and faster in terms of accuracy than the schemes for step number  $k = 3$  and  $2$  respectively after the comparisons with their exact solutions and other existing methods.*

**KEYWORDS:** Stochastic delay differential equation, block method, linear multistep method.

*Mathematics Subject Classification 2010:* 34K28; 65F30; 90C30; 90C26

**Received:** Dec 31, 2020; **Accepted:** Jan 20 2021; **Published:** Feb 12, 2021; **Paper Id.:** IJMCARJUN20211