

## Analytical Solution of Non-Autonomous Discrete Non-Linear Schrodinger Equation With Saturable Non-Linearity

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**Abstract :** It has been elucidated here that non- autonomous discrete non-linear Schrödinger equation is associated with saturable non-linearity through photo-refractive media. We have investigated the localized solution of non-autonomous saturable discrete non-linear Schrödinger equations. The similarity transformation has been involved in converting non-autonomous saturable discrete non-linear Schrödinger equation to constant-coefficient saturable discrete non-linear Schrödinger equation (SDNLSE), whose exact solution is already known. By back substitution, the solution of the non-autonomous version has been obtained. We have analysed our solution for the hyperbolic and periodic form of gain/loss term, and interesting results have been obtained. The most important characteristic role is that it helps us to analyse the propagation of electromagnetic waves in glass fibres and other optical wave mediums. Also, the usage of SDNLSE has been seen in tight binding for Bose-Einstein condensates in optical mediums. Even the solutions are interrelated, and its properties are prominently used in various physical aspects like optical waveguides, Bose-Einstein (B-E) condensates in optical mediums, Non-linear optics in photonic crystals, and non-linear kerr-type non-linearity effect and photo refracting medium.

**Keywords :** B-E-Bose-Einstein, DNLSE-Discrete non linear schrodinger equation, NLSE-non linear schrodinger equation, SDNLSE - saturable discrete non linear Schrodinger equation

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