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NEW APPROACHES FOR SOLITON PULSES IN INHOMOGENEOUS SYSTEMS

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ABSTRACT: Interest in soliton pulses have grown rapidly in recent years due to their potential applications in long distance communications. These are localized electromagnetic waves propagating in nonlinear media with dispersion and/or diffraction without any change in shape or intensity. From a mathematical point of view, solitary waves or solitons are exact propagative solutions of a certain class of nonlinear partial differential equations (e.g. Korteweg de-Vries equation, the nonlinear Schrödinger (NLS) equation, Sine-Gordon equation, etc.) The existence of soliton states implies perfect balance between nonlinearity and dispersion effects which usually requires specific conditions. It should be noted that nonlinear optics is the field where all soliton features are exhibited to a great extent.

In this work, we aim to find many soliton solutions of some higher-order nonlinear equations that possess variable coefficients by applying new approaches. It is to be noted that the considered models describe the propagation of light pulses in many nonlinear systems. Importantly, new analytical dark and bright soliton solutions expressed in terms of the model coefficients are found. These exact solutions are useful to understand the mechanism of the complicated nonlinear physical phenomena which are related to wave propagation in a higher-order nonlinear and dispersive physical system.

KEYWORDS: soliton, nonlinear equations, nonlinearity effect, dispersion effect