List of Publications and Communications :

1) *ON SOME EXACT SOLUTIONS OF SLIGHTLY VARIANT FORMS OF YANG'S EQATIONS AND THEIR GRAPHICAL REPRESENTATIONS*

Pramana- *J. Phys.*, **70(5)**, 763(2008)

Abstract. The equations obtained by Yang while discussing the condition of self- duality of *SU(2)* gauge fields on Euclidean four-dimensional space have been generalized. Exact solutions and their graphical representations for the generalized equation (for some particular values of the parameters) have been reported. They represent interesting physical characteristics like waves with spreading solitary profile, spreading wave-packets, waves with pulsating solitary profile (between zero and a maximum), waves with oscillatory solitary profile and chaos.

2) *SOME WAVE-LIKE AND LAPLACE-LIKE NONLINEAR PARTIALDIFFERENTIAL EQUATIONS AND THEIR EXACT SOLUTIONS WITH GRAPHICAL REPRESENTATIONS HAVING UNCOMMON CHARACTERISTICS**

Abstract. Exact solutions with graphical representations of some Wave-like and Laplace-like nonlinear partial differential equations have been presented. The equations are new particular cases of the generalizations of the equations obtained by Charap for Chiral invariant model of pion dynamics under tangential parameterization. Some of the interesting characterestics of the solutions reported here are (i) initially solitary waves which become undefined at a particular point of time, (ii) initially solitary waves whose amplitude increases infinitely after a short span of time and (iii) well-behaved solitary waves with solitary profile.

3) *A COMPARATIVE DISCUSSION OF THE RESULTS OF PAINLEVE' TEST FOR INTEGRABILITY AND NATURE OF SOME EXACT SOLUTIONS FOR GENERALIZED YANG'S EQUATIONS***

Abstract. Saha and Chanda [43] presented a generalized form of the equations obtained by Yang while discussing the condition of self-duality of *SU(2)* gauge fields on Euclidean four dimensional space. Apart from physical interest the equations are mathematically challenging as well. Exact solutions and some other solutions reported here have been reviewed in the light of an important mathematical property, namely Painleve' property. Painleve' test for integrability according to Weiss, Tabor and Carnevale [11] has been utilized for that purpose. It has been observed that those situations where well behaved exact solutions are available and the solutions can be represented explicitly in terms of dependent variables pass the Painleve' test for integrability. On the other hand, the situation where well behaved exact solutions are not available and / or the solutions cannot be represented explicitly in terms of independent variables do not pass the Painleve test for integrability. There has been one exception, however. A situation occurs where well-behaved explicit solution exists and, at the same time, the equation fails the Painleve test for integrability. The propositions behind the formalism of Ablowitz, Segur and Ramani [9] has been used for an explanation of this situation.

4) ***ON SOME APPROXIMATE SOLUTIONS WITH GRAPHICAL REPRESENTATIONS OF COMBINED YANG--CHARAP EQUATIONS AND THEIR RELATIONS TO SOME EXACT SOLUTIONS OF GENERALIZED YANG EQUATIONS***

- *j. Math.*, **II(1)**, 37(2009)

Abstract. Some approximate solutions of combined Yang--Charap equations (proposed by Chakraborty and Chanda [14]) have been obtained. The equations are a combination of two sets of nonlinear PDEs originating from two different physical situations. One of the two sets of equations was obtained by Yang [15] while discussing the condition of self-duality of *SU(2)* gauge fields on Euclidean four-dimensional space. The second one was reported by Charap [16] for the chiral invariant model of pion dynamics under tangential parametrization. The approximate solutions presented here have been found to be the exact solutions of the generalized Yang equations (proposed by Saha and Chanda[43]). These equations are parametric generalizations of the equations due to Yang [15] stated above.

5) ***A COMPARATIVE REVISIT TO THE PAINLEVE' TESTS FOR INTEGRABILITY OF YANG EQUATIONS, CHARAP EQUATIONS AND THEIR COMBINATIONS AND SOME UNEXPECTED OBSERVATIONS*****

Abstract. Painleve' test for integrability according to Weiss, Tabor and Carnevale [11] as applied by Chakraborty and Chanda [39,40,41] to the Yang-equations [15], Charap equations [16] and the Combined Yang-Charap equations [14] have been revisited. Basically two new observations have been reported. (i) From the presentation of Chakraborty and Chanda [41] one could get the impression that for the leading order analysis of the combined equations the prominent role is played by the part that comes from the Yang equations. In the present paper it has been shown that both the Yang equations [15] and the Charap equations [16] contribute to the leading order analysis of combined Yang-Charap equations [14]. (ii) The Charap equations have two branches instead of one branch as was reported by Chakraborty and Chanda [40]. For the second branch of the Charap equations [16] other than that reported by Chakraborty and Chanda [40] the existence of requisite number of arbitrary functions in the Laurent-like expansion has been investigated. The expansion seems to allow arbitrary functions more than that is required for being a general solution. The similar situations occured to the combined Yang-Charap equations in the work of the Chakraborty and Chanda [41] which could not be completed for the involved nature of calculations.

6) ***A COMPARATIVE DISCUSSION OF THE RESULTS OF PAINLEVE' ANALYSIS ACCORDING TO WEISS ET AL. AND THE SEARCHFOR EXACT SOLUTIONS*****

Abstract. In this paper a comparative study of the Painleve' properties (according to Weiss *et. al* [11]) and the existence of exact solutions of the generalised Charap equations for different values for the parameters. The equations are the generalisation of the Charap's equations [16] for Chiral invariant model of pion dynamics under tangential parametrization. In general, it has been observed that the equations admit unusual Painleve' properties according to Weiss *et. al.* [11] for different values of the parameters in the equations. It also appears to discover a situation where the Painleve' analysis according to Weiss *et. al.* [11] cannot attain much success. These evidences add to the data which aims to study why the Painleve' analysis according to Weiss *et. al.* enjoy so wonderful success in some cases and suffers failures in some other situations.

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* mark papers are not published at the time of submission of thesis, they were in press at that time.

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